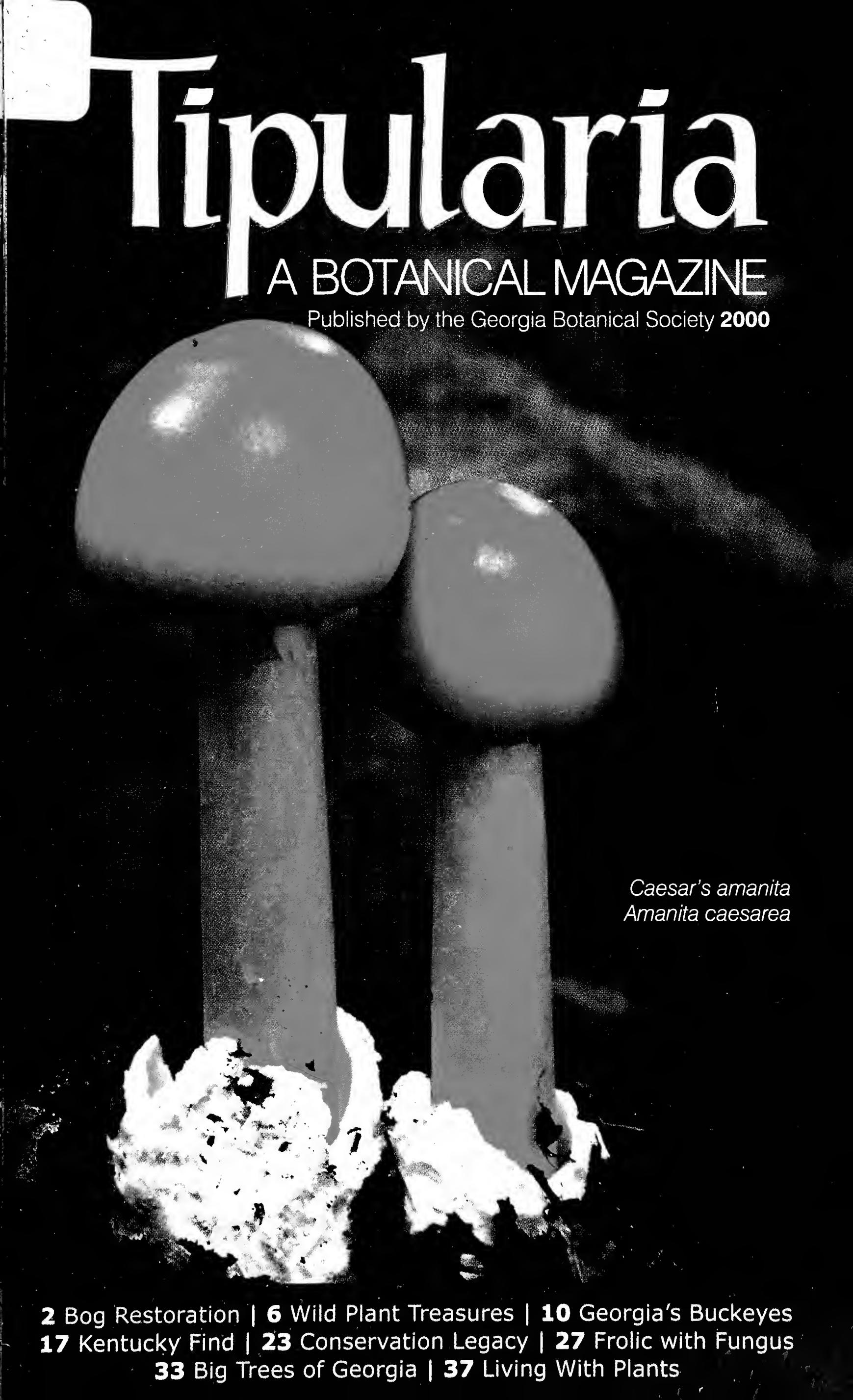


Típularia

A BOTANICAL MAGAZINE

Published by the Georgia Botanical Society **2000**



Caesar's amanita
Amanita caesarea

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BYLINERS

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continued inside back cover

MEMBERSHIP

The Georgia Botanical Society is open to all persons interested in the botany of Georgia. Annual dues: Individual or Family: \$25, Group: \$30, Student \$10. Send address and check payable to Georgia Botanical Society to Teresa Ware (2 Idlewood Ct., NW; Rome, GA 30165-1210). Members receive *Tipularia* without extra charge. Persons wishing only to receive the magazine may become *Tipularia* associates for \$10 a year. Single copies, when available, may be ordered from Sally Emory (7575 Rico Rd.; Palmetto, GA 30268). Copies of 1991 and before are \$5 and copies after 1991 are \$10.

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Tipularia

A BOTANICAL MAGAZINE

Volume 15
2000

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Caesar's amanita (*Amanita caesarea*)
Photo by Debra H. Davis

On the back cover:
Ohio buckeye (*Aesculus glabra*)
Photo by Richard Ware
Kentucky ladyslipper (*Cypripedium kentuckiense*)
Photo by Shan Cammack
Large-flowered trillium (*Trillium grandiflorum*)
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Atlanta Botanical Garden: Restoration Efforts on Herbaceous Bogs of the Southeastern United States

by Carol Helton



Whitetop pitcherplant
(*Sarracenia leucophylla*).

Atlanta Botanical Garden

The Atlanta Botanical Garden (ABG) has always considered conservation to be an integral part of its mission. The ABG and its Conservation Program have earned an international reputation as leaders in plant conservation. Its dedicated staff not only maintains a refined expertise in horticultural sciences but assumes an aggressive "hands-on" approach for each project undertaken. The Conservation Program constantly seeks new opportunities to collaborate with other institutions locally and internationally. In fact, it is a charter member of the Georgia Plant Conservation Alliance (GPCA), an umbrella organization dedicated to harnessing

horticultural advances in the name of conservation. Currently, the ABG is cooperating with The Nature Conservancy, Georgia Natural Heritage Program, United States Fish and Wildlife Service, and other regional botanical gardens to preserve and restore threatened plant communities in the Southeast. The ABG has been instrumental in developing many of the horticultural techniques for rare plant propagation and restoration that have been applied in field settings by the GPCA.

Conservation

In addition to maintaining one of the world's most comprehensive and stunning collections of carnivorous plants from the Southeast and around the world, the ABG has remained active in monitoring, restoring, and conserving the habitats within which these remarkable plants thrive. ABG's Conservation Program has been especially active working in the unique and species-rich bog communities found throughout the Coastal Plain and Southern Appalachian Mountains of the Southeastern USA.

In the Southeast, herbaceous bogs are found in areas where the soils remain wet nearly year-round, but are rarely ever inundated. They are frequently dominated by grasses, sedges, and a variety of forbs. Bogs are typically classified as one of two types: seepage bog or open savanna bog. Seepage bogs are found where groundwater flows laterally through peaty-sandy soils and where

the water exudes to the surface. Savanna-type bogs are formed in areas where water is perched near the surface by a clay hardpan located in the subsoil (Clewell 1985). Bogs of the Southeast support a wealth of rare and unique life forms, many of which are found in no other habitat type.

Unfortunately, many of these plant communities have been reduced to small, fragmented sites as a result of land conversion, drainage, fire exclusion, invasive species, soil erosion, and herbicide use. With little or no buffer to offset encroaching human activities, the species diversity declines. The loss of habitat for the carnivorous pitcher-plants (*Sarracenia*) endemic to the Southeastern US has been estimated at 97% (Groves 1993).

ABG's expertise in these habitats is based on more than 15 years experience in the field —working with landowners and other conservation organizations that have managed such sites for over 40 years. While the primary goal is to conserve intact habitats and buffer zones, the ABG has also concentrated on developing techniques to propagate, restore, and manage several of the species that are important to these habitats. The ABG has successfully restored such communities and has re-established the critical processes that maintain species diversity.



**Green pitcherplant habitat
(*Sarracenia oreophila*).**

“over-grown” bogs results in a die-back of the invading trees and shrubs, exposes bare mineral soil necessary for germination, and allows sunlight to reach the low herbaceous vegetation. By maintaining a healthy herbaceous layer, we are also restoring a fuel layer that will be beneficial to future prescribed burns.

Depending on the community type, condition, and species diversity, controlled burning can be modified to achieve a particular goal simply by burning at different seasons or at different intensities. For example, when restoring a degraded habitat (e.g. removing woody species and reducing the fuel layer), winter burns are very effective. If the objective is to maintain the condition of a bog following initial restoration (e.g. controlling re-sprouting woody species), then summer burns are more effective. ABG now uses a combination of the two fire regimes with severely degraded habitats.

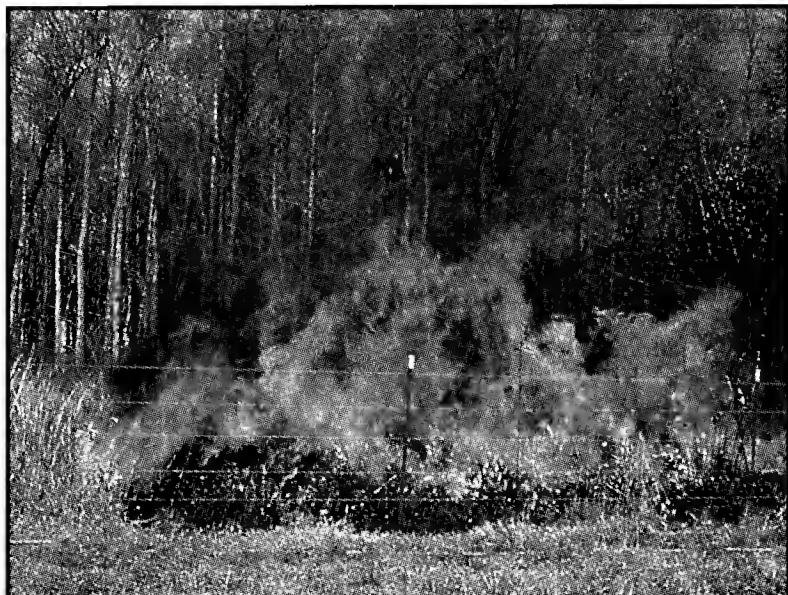
Historically, winter burns were probably the result of Native American land management to improve food plots for game. Winter burns are in fact still favored by most landowners today. Burning during the winter can be effective in controlling the buildup of sedge and grass species that can choke out other less vigorous herbaceous species. Because many bog species are adapted for burning, their flowering buds can even survive fires that occur very early in the growing season. An added benefit of winter burning is that the nutrients released

Restoration Components

The primary components targeted for restoring herbaceous bog communities include the vegetation composition, regular disturbance regimes, and hydrology.

VEGETATION AND DISTURBANCE

Maintaining the herbaceous layer is crucial to conserving bogs in the Southeast. Invasion of woody species eventually eliminates pitcher plants and other herbaceous species by aggressively competing for sunlight. For the ABG, the primary method of controlling woody species is prescribed fire. Burning these



Prescribed burning improves habitat for herbaceous bogs.

by scorched plants are able to leach from the soil before invading plants can capitalize on the nutrient pulse. Although this might sound contradictory, some bog species like pitcherplants thrive in low nutrient soils.

When bogs have become intensely degraded by invading woody vegetation, it is necessary to first cut back the shrubs and trees and to follow through with burning. One effective technique is to scorch the re-sprouting stems with a simple, clean, and highly effective propane-fueled flame thrower developed by a pitcher plant expert from Mississippi. This technique damages the cambium layer of the woody vegetation, which affects sap-flow, and makes the plants susceptible to disease and decay. It can be especially effective during summer months when pathogens of woody plants are abundant.

Unfortunately, the use of prescribed burning to restore plant communities has been compromised by a fear and intolerance of fire in the general public that has been perpetuated by symbols like "Smokey Bear." Furthermore, despite the fact that thousands of prescribed burns are conducted successfully each year without incident, stewardship ecologists will long have to contend with the memory of the "Los Alamos" fires in New Mexico that went terribly awry in Spring 2000. Because the general public knows very little about the fire ecology of our natural systems, it is important to develop close community relations and

education programs which demonstrate the benefits of such restoration and the consequences for suppressing fire.

HYDROLOGY

The restoration and maintenance of a bog's hydrology and soil structure is as important as maintaining regular burning regimes for ensuring healthy herbaceous vegetation. Unfortunately, the hydrology of thousands of bogs throughout the Southeast has been modified by drainage ditches and tiles to promote agricultural development. A simple but effective restoration method is to dam up ditches using the organic debris accumulated from clearing the site. Doing so slows water flow into the bog, reduces erosion and the formation of shallow ponds, and helps to maintain a higher water table. The debris also acts as a sieve to reduce siltation that can eventually smother those species that are adapted to the hydric soils of bogs. The hydrology of bogs can be so sensitive that it can even be altered by restoration activities like removal of woody species. Whenever restoration efforts are undertaken, every effort must be made to minimize the use of heavy machinery and foot-traffic. Disturbing the soil's surface, particularly during the wet season, can result in the for-



Chinese privet (*Ligustrum sinense*) pulled by Ron Determann.



Ron Determann and Malcom Hedges restore hydrology to a bog by filling a ditch.

mation of ruts, puddles, and ruderal sites where opportunistic plants (e.g. briars and exotic species) can take hold. Moreover, damage to the hard pan that perches water close to the soil's surface can be very difficult to restore.

Plant Propagation

Another vital component of restoration is the reintroduction and recovery of rare and endangered species. ABG's role in recovery projects involves seed collection, propagation, and growth of indexed individuals to be used for reintroduction. ABG conducts many projects in collaboration with The Nature Conservancy, other GPCA members, and is under contract with the US Fish & Wildlife Service to assist in the recovery of several endangered plant species. At present, ABG is focusing on the recovery of four Federally Endangered bog species, mountain sweet pitcher plant (*Sarracenia rubra* spp. *jonesii*) in North and South Carolina, green pitcher plant

(*S. oreophila*) in Georgia and Alabama, Alabama canebrake pitcher plant (*S. alabamensis*) in Alabama, and swamp pink (*Helonias bullata*) in Georgia and North Carolina.

Future Work

ABG plans to continue ongoing projects and to seek yet-undiscovered bog sites that may need preservation or restoration. Our goal here at ABG is to fill a niche which larger organizations generally do not, namely ensuring the long-term survival of several small-scale sites across Georgia. We are looking for small-scale sites within which we can ensure and prolong the long-term survival of these rare plant communities. ☺

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Editor's Note: The 1998 issue of *Tipularia* contains an article about the Georgia Plant Conservation Alliance. The 1987 and 1993 issues of *Tipularia* contain articles about pitcher-plants. Look at the 1991 issue of *Tipularia* for another article on the Atlanta Botanical Garden and a spotlight on Director Robert Bowden.



Propogating plants for restoration and reintroduction.



Rabun County: Georgia's Wild Plant Treasure Trove

by Tee Brower

*N*estled in the northeast corner of Georgia's mountains is Rabun County, purported by locals to be the place where spring spends the summer. While Rabun County is a treasure trove of spectacular plants at any season, this writing describes some of the easy to access haunts of spring flowers and ferns.

Chattooga River Site

In a moist, shadowy cave on the Georgia bank of the Wild and Scenic Chattooga River dwells the rare Appalachian filmy or bristle fern (*Trichomanes boschianum*). Fronds of this small jewel are filmy with greatly dissected pinnae consisting of a single translucent cell layer that glistens in the sunflecks. This fern's most curious feature is its spore-bearing apparatus, an inverted cone-shaped

indusium from which a fertile projection lifts the sporangia. This rare treasure, which goes unnoticed by most casual cave probers, is found at three sites in Rabun County. The Chattooga cave is the most easily accessible and here fern enthusiasts can find this special treat just by making a small journey. Park in the small Forest Service lot on the Georgia side of the Highway 76 Bridge and take the Chattooga Trail to the top of the first rise. Here the trail forks. Take the fork leading downward toward the river and continue north along the riverbank until the small cave appears on the left. Be careful not to disturb the cave dwellers!

This short walk passes through a species-rich area. The abundance allows for easy trailside photography of many common flowers such as windflower (*Anemone quinquefolia*), green-and-gold (*Chrysogonum*



Photo courtesy of Georgia Natural Heritage Program.

Green and gold (*Chrysogonum virginianum*).

virginianum), trilliums (*Trillium* spp.), bell-worts (*Uvularia* spp.), numerous species of blue and yellow violets (*Viola* spp.), Indian physic (*Porteranthus trifoliatus*), and possibly fire pink (*Silene virginica*). Big rewards for little energy.

Estatoah Falls

An often overlooked trove of intriguing plants is the Estatoah Falls area reached from Wayfarer Lane off Highlands Highway 246. The lane leads to a gated picnic site and pumping station owned by Georgia Power Company. This area is a privately-owned family park. Special permission is required.

Spring arrives somewhat earlier than higher elevations in this piney woods which is criss-crossed by little feeder creeks and moist seeps. Estatoah Falls, which may be seen from Highway 246, tumbles into Mud Creek which borders the area. Here several species of trillium can be found in early spring. Toadshade (*T. cuneatum*) debuts with both maroon and yellow-green forms well-represented. Some individuals are giants of their kind. Early April brings other species, like Vasey's (*T. vaseyi*), red (*T. erectum*), and Catesby's (*T. catesbaei*). On the drier hillsides are found many pink ladyslippers (*Cypripedium acaule*), always a delight to behold. Other Orchid Family (*Orchidaceae*) members common to the various micro-habitats of these woods are putty root (*Aplectrum hyemale*), showy orchis (*Galearis spectabilis*), rattlesnake plantain (*Goodyera pubescens*), and the cranefly orchid (*Tipularia discolor*), our publication's namesake. These follow blooming at various times later in the season.

On moist higher slopes are both species of *Arisaema*. Jack-in-the-pulpit (*Arisaema triphyllum*) among the earliest spring emergents, presents its several color varieties: green, purple, and vividly striped. Green-dragon (*A. dracontium*) has its fling in late April. Pennywort (*Obolaria virginica*) is found in these woods as well as columbo (*Frasera*

caroliniana).

caroliniana). These are both members of the Gentian Family (*Gentianaceae*).

The Estatoah Falls area is also a haven for common spring members of the Lily Family (*Liliaceae*). Abundant are Solomon's-plume or false-Solomon's-seal (*Smilacina racemosa*), Indian cucumber-root (*Medeola virginiana*), Solomon's-seal (*Polygonatum biflorum*), and white Clinton's lily (*Clintonia umbellulata*).

Other species found here in significant numbers include wild geranium (*Geranium maculatum*), Carolina cranesbill (*G. carolinianum*), squaw-root (*Conopholis americana*), shrub-yellowroot (*Xanthorhiza simplicissima*), striped pipsisswa (*Chimaphila maculata*), spotted jewelweed (*Impatiens capensis*), May-apple (*Podophyllum peltatum*), golden Alexanders (*Zizia aurea*), meadow-parsnip (*Thaspium barbinode*), yellow stargrass (*Hypoxis hirsuta*), spiderwort



Photo by Carol and Hugh Nourse

Great white trillium
(*Trillium grandiflorum*)
with bellwort (*Uvularia grandiflora*).

(*Tradescantia* sp.), foamflower (*Tiarella cordifolia*), bloodroot (*Sanguinaria canadensis*), field madder (*Sherardia arvensis*), wood-sorrel (*Oxalis* sp.), buttercups (*Ranunculus* spp.), and white baneberry (*Actaea pachypoda*). Even as you emerge from the car, a mat of *Phacelia* may catch your eye. It occurs in a tangle of old vines and numerous common annuals growing beside the babbling creek.

Betty's Creek Cove

Rabun County boasts eight species of trillium. Perhaps the most spectacular showcase for this genus occurs on the Hambidge Center property which is located just a few minutes out of Dillard in the beautiful Betty's Creek Cove. Turn left and follow Betty's Creek Road to Moon Valley Road. Turn left, cross Betty's Creek Bridge, and park on the right shoulder. Here an easy trail wends its way gently upward through an old homestead, complete with an old plant-covered springhouse, and into a virtual sea of pink, white, and maroon trilliums. This breathtaking spectacle reaches its peak in early to mid April and there are literally tens of thousands of blossoms. Represented in this

trillium paradise are the great white (*T. grandiflorum*), Vasey's (*T. vaseyi*), and possibly others.

Beginning in late March and through early summer, this trail provides an ever-changing panorama of "spring things." Representative genera are: *Tradescantia*, *Medeola*, *Clintonia*, *Disporum*, *Polygonatum*, *Erythronium*, *Uvularia*, *Hypoxis*, *Anemone*, *Sisyrinchium*, *Goodyera*, *Galearis*, *Asarum*, *Xanthorrhiza*, *Cypripedium*, *Veratrum*, *Thalictrum*, *Ranunculus*, *Trautvetteria*, *Hepatica*, *Stellaria*, *Diphylleia*, *Dentaria*, *Tiarella*, *Sanguinaria*, *Podophyllum*, *Claytonia*, *Phacelia*, and many more. A short bushwack along the old roadbed that intersects this trail may reveal the elusive ladyslipper (*Cypripedium calceolus*), as well as columbo.

This place is a wildflower wonderland from which no professional botanist or amateur plant lover walks away unawed. Timing, of course, is everything!

Tennessee Rock Trail

Wild plant buffs who are willing to hike an easy to moderate 2.2 miles will enjoy the Tennessee Rock Trail at Black Rock Mountain State Park. Maps and an excellent interpretive guide are available at park headquarters. The guidebook provides information that defines the varied ecological areas along the trail, a key to the numbered markers, and facts about the geology of the area.

The park harbors eleven fern species and a club moss, many of which are within easy viewing range of the trail. Try to spot the following: running pine (*Diphasiathum digitatum*), rattlesnake fern (*Botrychium virginianum*), cinnamon fern (*Osmunda cinnamomea*), Christmas fern (*Polystichum acrostichoides*), rockcap fern (*Polypodium virginianum*), bracken fern (*Pteridium aquilinum*), and Southern lady fern (*Athyrium filix-femina* var. *asplenoides*). Sharp-eyed hikers may also find the others.



Photo by Carol and Hugh Nourse

Vasey's trillium (*Trillium vaseyi*).

Trillium lovers can enjoy seeing four species: red, Catesby's, Vasey's, and toad-shade. Many pink ladyslippers live in the pine forest area, and the rare yellow lady-slipper (*C. calceolus*) also occurs in the park. Spotted wintergreen or pipsissewa (*Chimaphila maculata*) is a more common resident of the piney woods and persists even though it was often collected for medicinal purposes and worn by Cherokee maidens as "love charms" to attract the object of their affections.

There is much to see trailside depending upon when you plan this adventure. Remember that due to the higher altitude of the mountain, spring lags behind lower elevations. Forty species of common herbaceous wildflowers are to be found in the park including: dwarf iris (*Iris cristata*), feather-bells (*Stenanthium gramineum*), yellow mandarin (*Disporum lanuginosum*), Indian pipes (*Monotropa uniflora*), and fly poison (*Amianthium muscaetoxicum*). In addition, a wide array of flowering trees and shrubs will reward the plant enthusiast.

The locations described in this article are but a few of the areas of Rabun County that are rich in species and unique for their ecology. Most are easy to find and have open access, and all require little energy expenditure while yielding 'great floral rewards.' ☺

Acknowledgments

Much of the information contained in this article has been gleaned from the author's wanderings about Rabun County. However, the following were used for assistance and verification.

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Editor's Note: Find an article in the 1999 issue of *Tipularia* which describes the plant communities in Rabun County.

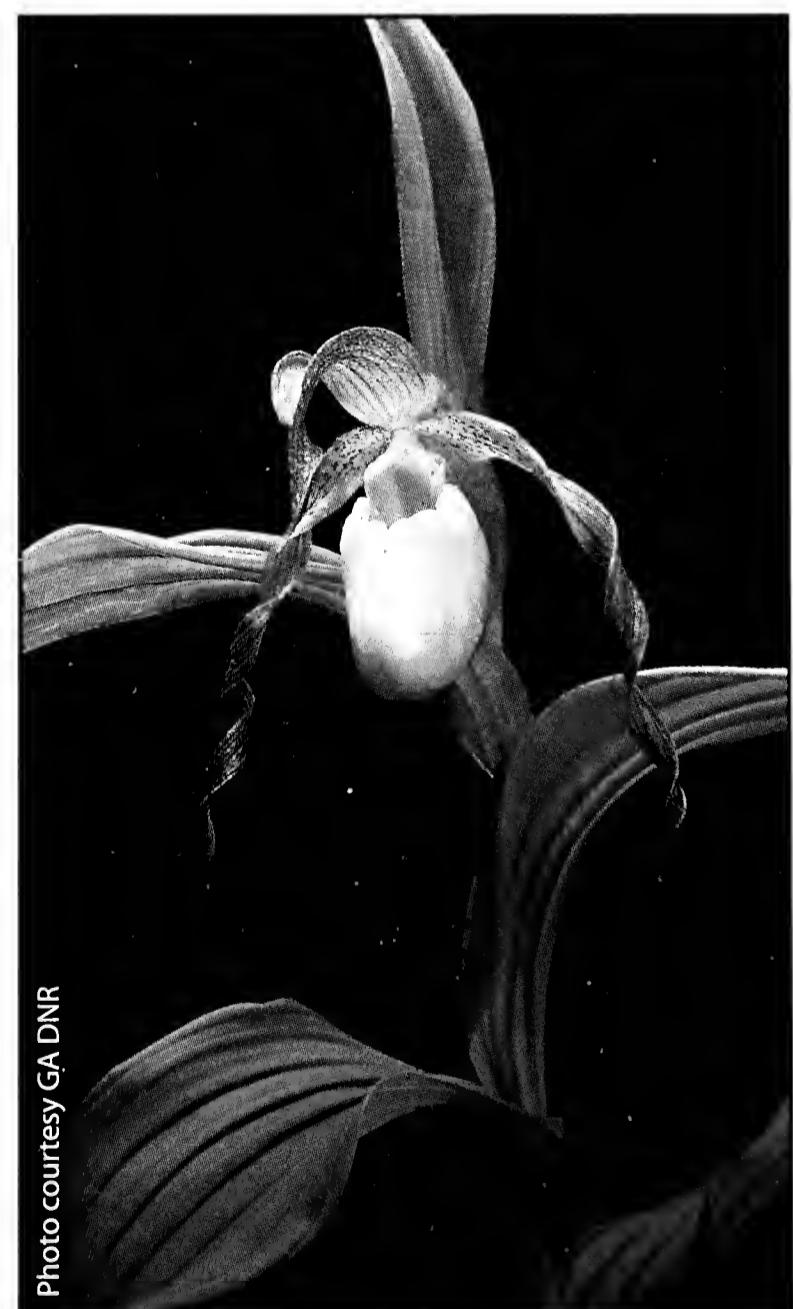


Photo courtesy GA DNR

Yellow ladyslipper (*Cypripedium calceolus*).



The Buckeyes of Georgia

by Richard T. Ware

Introduction

Buckeyes are in the genus *Aesculus*, which was named by Linnaeus, the father of modern botany. Although their fruits are inedible, and even poisonous, *Aesculus* is the ancient name for oak or mast-bearing tree. They are in the family *Hippocastanaceae*, commonly known as the buckeye or horse-chestnut family. This is a small family of trees and shrubs, with 2 genera and 15 species. It consists of the horse-chestnut genus (*Aesculus*) of North America, Europe, and Asia (13 species of deciduous trees or shrubs) and the genus *Billia* of Mexico and South America (2 evergreen species). This article will describe and differentiate between the 5 species of buckeyes native to Georgia. The horse-chestnut tree (*A. hippocastanum*) which is native to Europe will also be included in the keys because it has become naturalized in some areas. Buckeyes are known to hybridize frequently, with hybrids exhibiting intermediate characteristics of their parents. There are at least three named hybrids listed for Georgia that we will briefly discuss. For a more in-depth study on this subject, read

“Hybridization and Introgression in Buckeyes” (DePamphilis and Wyatt 1989).

Common Characteristics of the Buckeyes

The buckeyes of Georgia are deciduous trees or shrubs, with opposite palmately compound leaves (all leaflets radiate from one point like the fingers of your hand) and 5-7 leaflets. The irregular flowers are in large, showy, upright clusters, with a five-lobed bell-shaped or tubular calyx and 4-5 petals which range from almost equal to very unequal in length. Many flowers are either male or female, but bisexual flowers can also be found at the base of the clusters. There are 5-8 stamens, which can be shorter or much longer than the petals, and 1 pistil. The fruit is a smooth to spiny capsule which splits

into 3 sections to reveal 1-3 (sometimes up to 6) large smooth shiny dark seeds, with a large lighter-colored scar. When the fruits split open, the sleek seeds show through the slit, resembling the eye of a deer and hence the common name. Although it is said that the leaves and fruit of buckeyes are toxic, it has

*The two keys
found at the end
of this article will
help you discern
the buckeyes.*

been observed that squirrels will rob the seeds from the fruit before they fall. It is unknown if these squirrels survive this feast, but it is possible that fruits that are poisonous to humans and livestock may not be to wild animals.

Yellow Buckeye (*Aesculus flava*)

The species name *flava* means yellowish. This tree was formerly known as *A. octandra*, which means 8 stamens. The yellow buckeye is by far the largest of the buckeyes native to Georgia. It can be a very large forest tree, is more commonly found, and reaches its largest size in the northern cove hardwood forests of the North Georgia mountains. Yellow buckeye makes a nice shade and ornamental tree with its clusters of showy yellow flowers that usually appear from middle to late April. It grows fast, especially when young, and matures in 60-80 years, but needs plenty of moisture for good growth. Some people still carry a buckeye in their pocket for good luck or to ward off rheumatism. Yellow buckeye is primarily a species of extreme north Georgia, but is also found in the Piedmont counties of Elbert, Oglethorpe, and Wilkes. In north Georgia it can be found in Stephens, Rabun, Towns, Union, White, Gilmer, Murray, Whitfield, Walker, and Gordon counties. It has been recently collected in northern Floyd County. Several wonderful specimens, and the largest in Georgia, can be observed at Sosebee Cove Scenic Area located on Highway 180, west of Vogel State Park. This large tree (found in Union County) has a circumference of 15' 11", a height of 154', and a crown spread of 60'. The national champion is located on the Gabes Mt. Trail in the Great Smoky Mountains National Park, Tennessee, and has a circumference of 19' 1", a height of 136', and crown spread of 53'.



Photo by Richard T. Ware

Yellow buckeye (*Aesculus flava*).

Distinguishing Characteristics

It is the only *large, straight-trunked* buckeye in Georgia. These should not be confused with the medium-sized Ohio Buckeyes at Pigeon Mountain in northwest Georgia, west of Lafayette. Leaves are large with the terminal leaflet usually 17-25 cm long x 5-10 cm wide; *stalk of leaflets usually less than 4 mm long; calyx and flower stalk with glandular trichomes (hairs);* the 4 flower *petals* are yellow and *very unequal* in length; *petal margin villous* (with long, soft, shaggy but unmatted hairs); *stamens* usually 12-17 mm long and are included (shorter than the side petals which are 19-24 mm); *calyx length 6-8 mm; end buds are large* and light orange or light brown, usually *16 to 18 mm long x 8 mm wide, with bud scales not keeled.* First year *twigs* are also larger, *generally greater than 6 mm in diameter*, and light tan in color; *fruit* husks smooth with a diameter between *5-8 cm*; usually containing 1-2 seeds.

Ohio Buckeye (*Aesculus glabra* var. *glabra*)

The species name *glabra* means smooth. Ohio Buckeye is a large shrub to medium-sized tree and is found in mesic (moist) forests with circumneutral soils. It is exceedingly rare in Georgia. For several years the only known locality for this species was at Pigeon Mountain. This location is still the only one where it grows



Photo by Richard T. Ware

Ohio buckeye (*Aesculus glabra*).

with any abundance and size and it is occasionally a medium-sized tree. Here it is found in the Pocket area on the west side of the mountain, and it is more abundant and of greater size on the east side near Waterfall Branch and on the road to Blue Hole Spring.

More recently it has been found at Poole Mountain in Gwinnett County, and has been reported from Paulding and Douglas counties (Steve Bowling *pers. comm.*). As with yellow buckeye, Ohio buckeye makes a good landscape choice on a moist site. While it doesn't grow as large as yellow buckeye, it has showy clusters of yellow flowers which also appear in early spring. Currently there is no listing for a Georgia champion Ohio buckeye. The national champion has a circumference of 12' 7", a height of 148', and a crown spread of 48', and is in Liberty, Kentucky. Ohio buckeye is on the Georgia Natural Heritage Program (2000) "Tracking List of Special Concern Plants of Georgia."

Distinguishing Characteristics

Flower petals almost equal; stamens 13-23 mm long and exserted (longer than lateral petals and extending out past longest petal); flower color pale yellow; petal margins villous; lateral petal 8-13 mm; calyx length 4-6.5 mm; shrub or medium sized tree; winter buds usually keeled (bud scales

with a prominent ridge); fruit 2.5-5 cm, **husk usually spiny; twigs with a fetid odor** when crushed; **twigs** smaller than yellow buckeye, usually **3-5 mm in diameter**, and with a **maroon-brown color; flower stalk pubescent, but not glandular**; end buds 1.5-1.7 cm; stalk of leaflets 4-14 mm long. Note: the Texas buckeye, *Aesculus glabra* var. *arguta*, which occurs in parts of Oklahoma, Kansas, and Texas, differs from our variety by having 7 leaflets instead of 5.

Red Buckeye (*Aesculus pavia*)

The species name *pavia* is the old generic name in honor of Peter Paaw (Petrus Pavius), a Dutch Botanist who died in 1617 in Leyden. Red buckeye is generally smaller than the preceding two and is usually a shrub or small understory tree. Its main claim to fame is the beautiful red to crimson flowers. While yellow buckeye is found in the north Georgia mountains, and Ohio buckeye is in only four counties north and west of Atlanta, red buckeye is found mainly in the Coastal Plain and



Photo by Richard T. Ware

Red buckeye (*Aesculus pavia*).

adjacent counties. It is also found in Floyd County and several other counties adjoining Alabama in the Ridge and Valley Province. Red buckeye can begin blooming when only 2-3' high, and blooms from early to late April. Buckeyes in general, and particularly red buckeye, are among the first trees to leaf-out in early spring, allowing identification in late March and early April. This plant makes a rather interesting looking shrub in cultivation. It will usually have several trunks or will branch close to the ground into several arching limbs. These support the beautiful red clusters of flowers and later the smooth-capsuled fruits. This is mainly a lowland tree, requiring lots of moisture for best growth. Perhaps the most popular cultivated buckeye is a hybrid between the red buckeye and the European horse-chestnut (*Aesculus hippocastanum*), called the red horse-chestnut (*Aesculus X carnea*). The state champion red buckeye is found in Tattnall County and has a circumference of 18", a height of 20', and a crown spread of 16'. There are two national champions. The first is located in Kalamazoo County, Michigan, which has a circumference of 7' 7", a height of 64', and a crown spread of 52'. The second is in Roanoke, Virginia, and has a circumference of 7' 11", a height of 58', and a spread of 48'.

Distinguishing Characteristics

Usually a **multi-stemmed shrub or small tree; only buckeye with red flower color;** leaf stalk (petiole) and leaflet mid-rib sometimes red; **scarlet tubular calyx** (other species are bell-shaped); **stamens slightly longer than petals**, 24-38 mm long; **petal margin glandular**; lateral petal 20-31 mm long; **calyx length 14-18 mm**; flower stalk (pedicel) without glands; fruit 3.8-5.8 cm broad with smooth husk; end buds 6-13 mm long; twig diameter 4 mm; stalk of leaflets 4-14 mm long.

Painted or Georgia Buckeye (*Aesculus sylvatica*)

The specific name *sylvatica* means wild, of woods or forests, from *sylvan* (one that frequents groves or woods). The painted or Georgia buckeye also usually blooms from middle to late April, and is found on river banks, alluvial woods, and swamp forests. It is found mainly in the Piedmont, but has been collected in an area from Burke to Gordon County and from Meriwether to Rabun County. This species is usually a shrub, but can sometimes be considered a small tree. There have even been documented cases along the Oconee River where it has reached 60' in height. It also makes a good landscape plant, but perhaps not quite as showy as the others because its flowers are a cream or greenish-yellow color. In the absence of flowers, it may be difficult to distinguish this species from red buckeye (*A. pavia*). The state champion is found on U.S. Forest Service land in Putnam County and has a circumference of 18", a height of 34', and a crown spread of 16'. (Editor's Note: See the Riddle article in this issue to discover the nominator of a former buckeye champion.)



Photo by Richard T. Ware

Painted buckeye (*Aesculus sylvatica*).

Distinguishing Characteristics

Multi-stemmed shrub or small tree; *stamens shorter than lateral petals (included)*, 16-25 mm long; *flower color yellowish-green or cream*; lateral petals 20-30 mm long; *petal margin villous, not glandular*; *flower stalk without glands*; calyx length 8-13 mm; fruit 2.2-4.1 cm broad, without spines; twig diameter 4.5-5.5 mm; end buds 7-9 mm; stalk of leaflet 4-14 mm long.

Bottlebrush Buckeye (*Aesculus parviflora*)

The specific name *parviflora* means small-flowered. The bottlebrush buckeye is the rarest of the five species discussed in this article. It only occurs in Alabama, Georgia, South Carolina, and possibly Florida. It is very rare in all but Alabama. In Georgia, it is found on mesic bluff and ravine forests in Chattahoochee, Harris, Stewart, Quitman, and Clay Counties in southcentral and southwest Georgia. Another site in Early County has not been verified in the last 20 years and may be extirpated. The collections in Georgia were made by James R. Allison, Fred Galle, Samuel B. Jones, and Robert F. Thorne. Robert Wyatt found a large population of *A. parviflora* in Aiken County, South Carolina (early June of 1983) in a steep ravine on the east side of the Savannah River just south of Interstate-20. This population was evidently discovered earlier (1977) by Steve Bowling and L. Greathouse, and is thought to be the same population that John Fraser and Andre Michaux had discovered in late May and early June of 1787. All the sites from Alabama, Georgia, and South Carolina are along major rivers draining the southern Appalachian Highlands, such as the Savannah, Chattahoochee, Alabama, Coosa, and Black Warrior. Although it only occurs in the Coastal Plain in Georgia, the hypothesis about its distribution is that it was originally an inhabitant of the hills of north Georgia and Alabama, and has been able to colonize the major riverways downstream, by way of the large floating seeds.

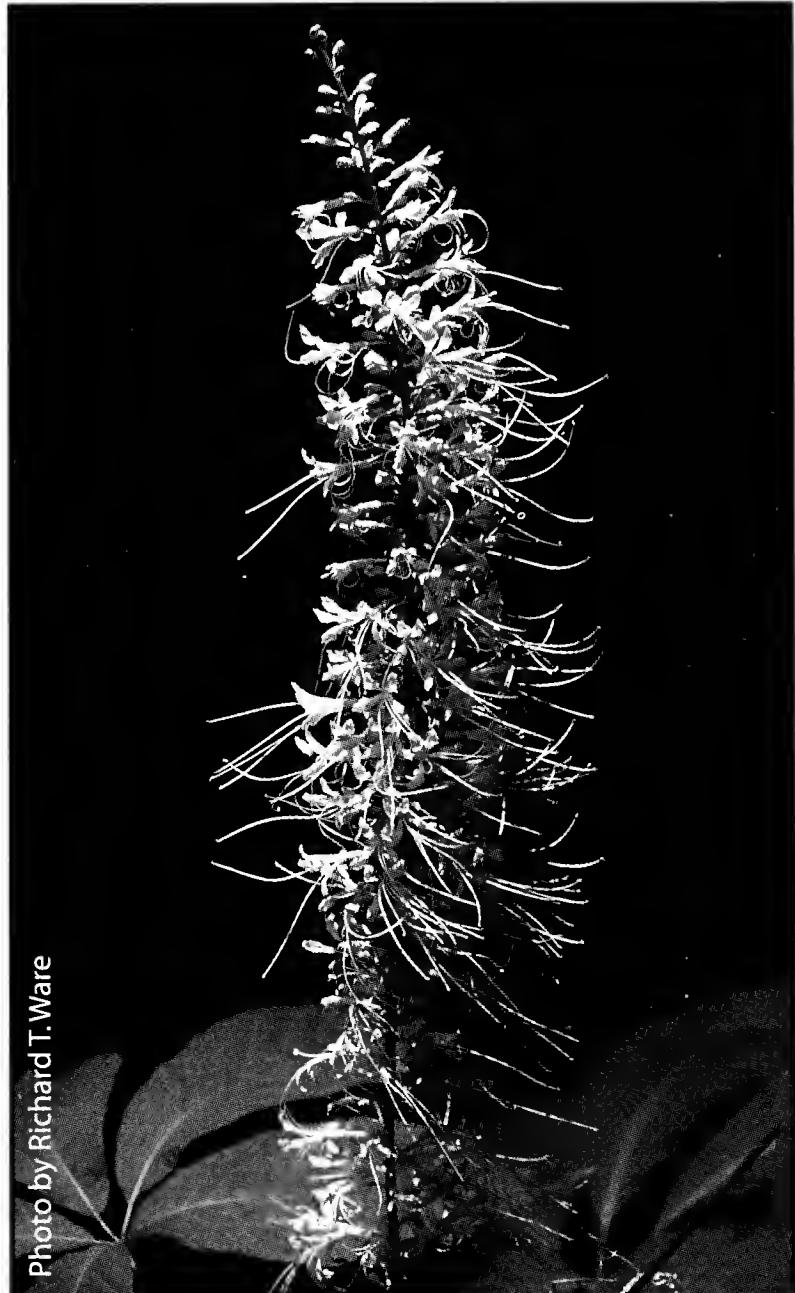


Photo by Richard T. Ware

Bottlebrush buckeye (*Aesculus parviflora*).

This is a beautiful shrub, with its striking white flowers in a narrow inflorescence 20-30 cm long. It makes an excellent landscape plant and should be cultivated much more frequently. There is no state champion bottlebrush buckeye. The national champion has a circumference of 2' 10", a height of 14', a crown spread of 20', and is located at Virginia Beach, Virginia.

Distinguishing Characteristics

Graceful shrub *growing in colonies*, with small *white flowers in a long slender showy panicle, 20-30 cm or more long*, resembling a bottle brush (hence the common name); *mature buds only 6-7 mm long with 4 exposed scales and exude a chalky substance*; *stalk of leaflets of larger leaves 14-31 mm long*; calyx 5-7 mm; petals 16-20 mm; *stamens long exserted, 3-4 times the length of the petals*; fruit 2.5-3 cm, with

smooth husk, *borne on long drooping stalks*; at least *some peduncles persist into the 2nd year blooming time; blooms from May to July*, which is later than the other species.

Hybridization of Buckeyes in Georgia

The latest thinking on this subject seems to indicate that there is a broad hybridization zone of at least 125 miles. This may represent the overlap of two hybrid zones, one between *A. pavia* and *A. sylvatica* and the other between *A. flava* and *A. sylvatica*. A study, however, of the hybrid populations between *A. pavia* and *A. sylvatica* revealed that these populations lacked one or more of the supposed parental species. Some scientists theorize that the explanation for the hybrid zone lies with the migration pattern of the ruby-throated hummingbird (*Archilochus colubris*). Their early spring migration (south to north) coincides closely with the flowering dates of the *Aesculus* species. The pollen being transported on the bird is viable over a distance of many miles and allows for the wide hybrid zone in Georgia among *A. pavia*, *A. sylvatica*, and *A. flava*.

There are three named hybrids recognized in Georgia: *Aesculus X mutabilis*, *Aesculus X neglecta*, and *Aesculus X worlitzensis*. The table below shows the putative parents of these hybrids. ☀

Acknowledgements

I would like to acknowledge the assistance of Teresa Ware, Tom Patrick, Steve Bowling, Patrick Sweeney, Robert Wyatt, and Wilbur Duncan (for the use of his unpublished keys to the shrubby buckeyes) in the preparation of this treatise. I accept responsibility for any errors in deduction, and the opinions expressed, if any, are my own.

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BUCKEYE HYBRIDS

SPECIES	HYBRIDS
<i>A. pavia</i> X <i>A. sylvatica</i>	= <i>A. X mutabilis</i>
<i>A. flava</i> X <i>A. sylvatica</i>	= <i>A. X neglecta</i>
<i>A. flava</i> X (<i>A. pavia</i> X <i>A. sylvatica</i>)	= <i>A. X worlitzensis</i>

WINTER KEY TO SPECIES OF AESCULUS IN GEORGIA

1. Leaflets usually 7, widest near apex; buds large, sticky (glutinous); flowers white, showy, with 3 upper petals marked at the base with red or yellow *A. hippocastanum*
1. Leaflets usually 5, widest at middle or slightly above; buds not sticky; flowers without mark of red or yellow at base 2
2. Flowers white; stamens long exserted, 3-4 times longer than petals; inflorescence narrow, 20-50 cm long; mature buds chalky, 6-7 mm long with 4 exposed scales; colonial shrub; fruit on long drooping stalks; some peduncles persisting until following year's blooming time; stalk of leaflets of larger leaves 14-31 mm; blooming May to July *A. parviflora*
2. Flowers cream, greenish yellow, yellow, or red; stamens included or if exserted less than twice the length of the longest petal; buds not chalky, over 7 mm long and imbricate; not colonial; fruit not on long drooping stalks; peduncles not persisting until 2nd yr; blooming usually April; stalk of leaflets of larger leaves sessile to 14 mm 3
3. Flowers red; calyx tubular; petal margin glandular; calyx length 14-18 mm; multi-stemmed shrub or small tree *A. pavia*
3. Flowers cream, greenish yellow, or yellow; calyx bell shaped; petal margin villosus, not glandular; calyx length less than 14 mm; shrub to large tree 4
4. Flower petals almost equal in length; stamens exserted; winter buds usually keeled (bud scales with a prominent ridge); fruit husk spiny; twigs with a fetid odor when crushed; twigs maroon-brown in color *A. glabra*
4. Flower petals unequal in length; stamens included; winter buds not keeled; fruit husk smooth; twigs without fetid odor when crushed; twigs tan in color 5
5. Calyx and pedicel with glandular trichomes; stalk of leaflets usually less than 4 mm; petals yellow; end buds 16-18 mm long; twigs > 6 mm in dia.; fruit 5-8 cm broad; large tree *A. flava*
5. Calyx and pedicel not glandular; stalk of leaflets 4-14 mm long; petals greenish yellow to cream; end buds 7-9 mm long; twigs < 6 mm in dia.; fruit 2.2-4.1 cm broad; shrub to small tree *A. sylvatica*

(Characteristics may not be sufficient to differentiate between the last 2 species in winter condition)

1. Buds sticky (glutinous); fruit capsule spiny; introduced species *A. hippocastanum*
1. Buds not sticky; fruit capsule smooth (spiny in *A. glabra*); native species 2
2. Mature buds chalky, 6-7 mm long, with 4 exposed scales; growing in colonies; fruit borne on long drooping stalks; some peduncles persist until 2nd yr. blooming time *A. parviflora*
2. Mature buds not chalky, > 7 mm long, imbricate with 6 or more exposed scales; not colonial; fruit not borne on long drooping stalks; peduncles not persisting to 2nd yr. 3

3. Fruit capsule spiny; bud scales usually keeled; 1st & 2nd yr. twigs maroon-brown, not tan; twigs with a fetid odor when crushed *A. glabra*
3. Fruit capsule smooth; bud scales not keeled; twigs tan; twigs without fetid odor when crushed 4
4. Buds 16-18 mm long; twigs > 6 mm in dia.; fruit 5-8 cm broad; large tree of north Georgia *A. flava*
4. Buds < 15 mm long; twigs usually < 6 mm in dia.; fruit usually < 5 cm broad; shrub or small tree mainly of Piedmont and Coastal Plain 5

5. Buds 3.8-5.8 cm broad; twigs +/- 4 mm in dia.; multi-stemmed shrub or small tree to 25' tall; mainly of the Coastal Plain and Ridge & Valley *A. pavia*
5. Fruit 2.2-4.1 cm broad; twigs 4.5-5.5 mm in dia.; shrub or tree to 60' in height; mainly of the Piedmont *A. sylvatica*

A Kentucky Find: The Georgia Discovery of the Kentucky Ladyslipper (*Cypripedium kentuckiense*)

by Shan Cammack and Tom Patrick

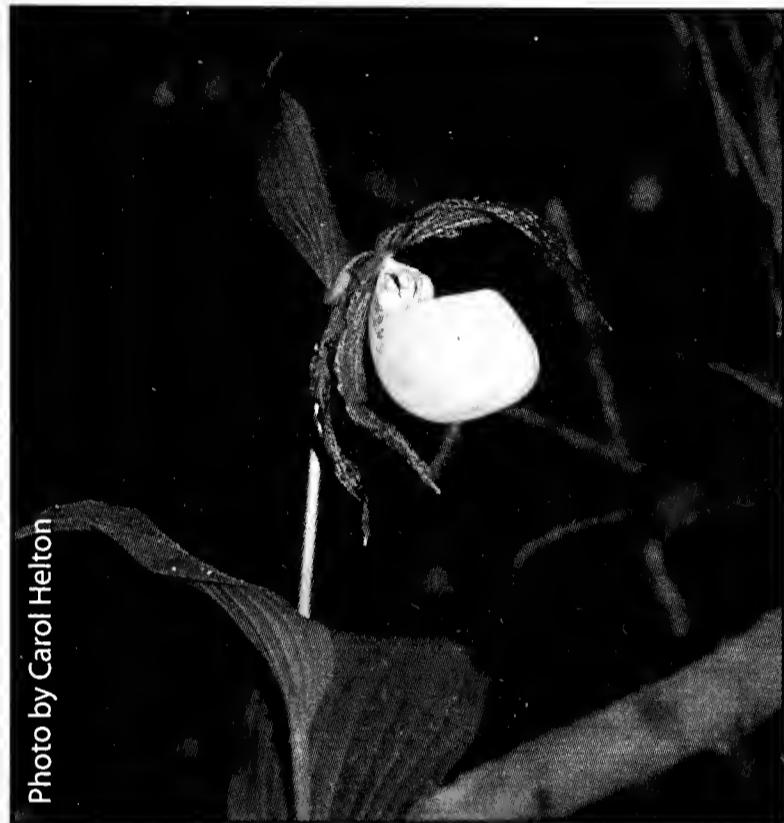


Photo by Carol Helton

Kentucky ladyslipper (*Cypripedium kentuckiense*) recently discovered in Georgia.

The Discovery

One of the biggest surprises during the 1999 surveys for the Ocmulgee skullcap (*Scutellaria ocmulgee*) was the discovery of a ladyslipper in south-central Georgia. Shan and coworker Eric had spent the day on the Oconee River ferreting out populations of the Ocmulgee skullcap. Our river guide, DNR Law Enforcement Ranger Richard Burnette, had shared stories of fishing spots and local landowners, memories of growing up in the mountains, and a curious tale of finding a ladyslipper during hunting season one year. Our interest was piqued of course, since Laurens County was so far from a ladyslipper's usual haunt. Although we both were a

As we emerged from the recovering mixed pine-hardwood forest and broke free from the tangles of catbriars, we stepped into the more mature remnant beech-maple-mixed oak forest and an image we were all dreaming of appeared before us: the large soft creamy pouch of the Kentucky ladyslipper (*Cypripedium kentuckiense*). We stood in awe at the beautiful orchid and fathomed what this new discovery to Georgia really means...

bit skeptical, we mustered our energy at the end of the day and set off to find Richard's mysterious ladyslipper.

We drove through pine plantations and agricultural fields and trudged through a scruffy secondary woods. Soon we found ourselves on a seepy hillside in a fairly lush deciduous forest. More diligent searching revealed the leaves of a ladyslipper! Surprised and amazed, we inspected the plant closely. We guessed that it probably was the yellow ladyslipper that Richard had seen in the mountains as a child. It was not until the following spring (during flowering) that we were able to get a positive identification. With its large ivory flowers, it could be none other than the Kentucky ladyslipper (*Cypripedium kentuckiense*).

History and Taxonomy

The Kentucky ladyslipper is a long-lived terrestrial orchid which flowers from mid-April to early May and fruits from July into August in Georgia. This species had never before been recorded from Georgia, but had been the subject of numerous searches in parts of the Cumberland Plateau of Tennessee by Tom and others in the Tennessee Native Plant Society during the late 1970's and early 1980's. This species is relatively recently described and is surely one of the more elusive and lesser publicized of all the North American orchids.

Taxonomic difficulties among the North American yellow ladyslippers have been lingering for close to two hundred years. Exactly when the Kentucky ladyslipper was first noted is in dispute, although a few names may apply that were used by the early botanist Constantine Rafinesque (1783-1840). Since none of Rafinesque's orchid specimens are extant and his descriptions are so brief, most taxonomists would agree that his names dating from the 1830's are too ambiguous to be of any use as correct names for the Kentucky ladyslipper. Rafinesque was quite observant and worked for a time in Kentucky at Transylvania University near where the orchid grows. Although it is feasible that he saw this plant, the obvious features needed for positive identification are not found in his brief descriptions.

Perhaps the first to clearly note what is today considered the Kentucky ladyslipper was the American orchidologist Donovan Correll (1908-1983). In his classic volume entitled *Native Orchids of North America*, Correll (1950) discussed the complex circumboreal nature of yellow ladyslippers, their intriguing transcontinental distribution across North America, and the tremendous variation in flower size, color, fragrance, and shape. In an earlier illustrated article (Correll 1940), he wisely concluded that "southern plants, particularly those of Kentucky and Louisiana, often have large lips which are occasionally more than 6 cm long." No taxonomic

recognition was given to this particular variation by Correll. Two more recent papers provided descriptions of the orchid and proposed names at the species level: *Cypripedium dawtonii* by Soukup (1977) and *C. kentuckiense* by Reed (1981). Soukup's publication failed to include the required Latin diagnosis, making his name invalid. Reed's description provided both the Latin diagnosis and a type locality. Refer to (Brown 1995) for a comprehensive overview of the nomenclatural history of the species, as well as an annotated bibliography.

Other kinds of *Cypripedium* found in Georgia include the pink ladyslipper (*C. acaule*), small-flowered yellow ladyslipper (*C. calceolus* var. *parviflorum*), and large-flowered yellow ladyslipper (*C. calceolus* var. *pubescens*). The Kentucky ladyslipper is readily distinguishable by observing these four characters: 1) lighter color of the slipper or pouch (creamy white to pale yellow), 2) larger lip or labellum (lip length up to 6.5 cm), 3) different shaped toe of slipper (see



Photo by Shan Cammack

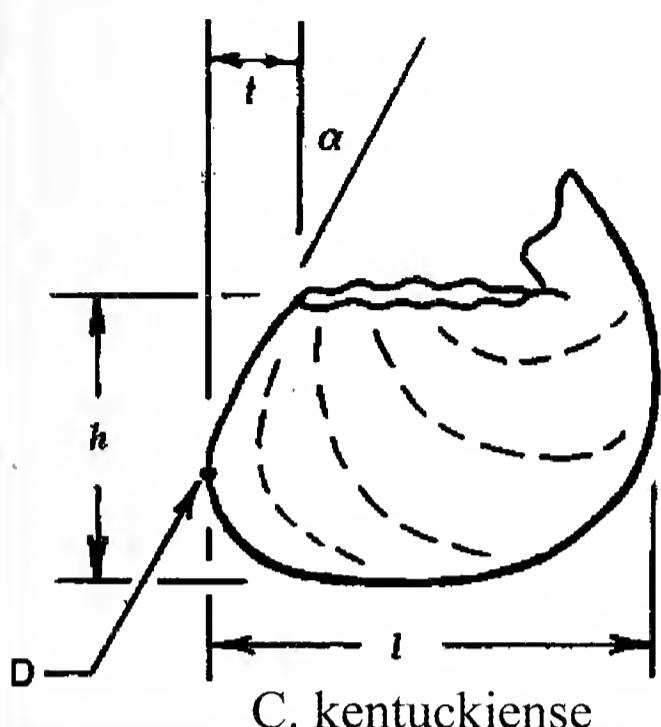
Close-up of the Kentucky ladyslipper flower
(*Cypripedium kentuckiense*).

Comparative morphology of the slippers.

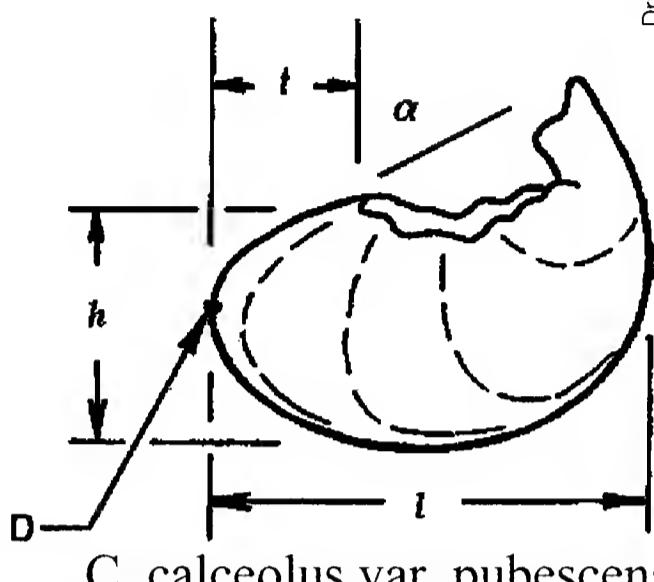
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5 cm

Drawing by Dennis Horn.



C. kentuckiense



C. calceolus var. pubescens

One of the key differences between the Kentucky ladyslipper and the large-flowered yellow ladyslipper is slipper geometry, as seen in the illustration (Patrick and Horn 1982). The slipper of the Kentucky ladyslipper is characterized by a relatively taller profile (h to l ratio) and a steeper angle (α) forward of the slipper opening. This opening is proportionately larger and extends closer to the "moccasin toe" (distance t is shorter relative to l). Point **D** or the distal end of the slipper is below the horizontal centerline (which is defined as the midpoint of height h).

illustration below), and 4) larger width of dorsal (or topmost) sepal that overhangs the pouch opening (width is 3.5-5.0 cm versus 1.5-3.0 cm for other yellow ladyslippers).

Habitat

Typically, the Kentucky ladyslipper is found in shaded alluvial habitats subject to occasional flooding. This includes forested springhead seeps in sandy soils and mature floodplain forests. The Georgia population (about two dozen plants) was found on the edges of seepy rivulets and terraces in a remnant beech-maple-mixed oak forest. The soils at this site are of the Orangeburg-Faceville Soil Series and are strongly acidic and well-drained and have low fertility (Smith 1991). These soils are often galled or gullied, with excess water draining into a series of intermittent and perennial streams.

There were some fairly mature trees scattered on the seepy slopes. Dominant canopy

species included beech (*Fagus grandifolia*), white oak (*Quercus alba*), and pignut hickory (*Carya glabra*). The understory was dominated by spicebush (*Lindera benzoin*), flowering dogwood (*Cornus florida*), rhododendron (*Rhododendron viscosum*), silverbell (*Halesia diptera*), and Florida maple (*Acer floridanum*). Cane (*Arundinaria gigantea*) was also abundant. The herbaceous diversity was reflective of mesic hardwoods and included wild geranium (*Geranium maculatum*), fringed loosestrife (*Lysimachia ciliata*), wild ginger (*Hexastylis arifolia*), and bloodroot (*Sanguinaria canadensis*). There were abundant ferns, including netted chainfern (*Woodwardia areolata*), royal fern (*Osmunda regalis*), cinnamon fern (*O. cinnamomea*), and Southern ladyfern (*Athyrium filix-femina* var. *asplenoides*).

Range and Status

The ladyslipper is found in ten states (see county distribution map). It is distributed on the Cumberland Plateau of Kentucky and northern Tennessee; the Eastern Highland Rim of south-central Tennessee; the Interior Highlands of Arkansas and Oklahoma; the Gulf Coastal Plain of Texas, Louisiana, Alabama, and Mississippi; and the Atlantic Coastal Plain of Georgia and eastern Virginia.

Distribution data was obtained from state heritage programs. There are a total of 184 records across the range of the species. These occurrence records are based on herbarium vouchers, site visits, and literature reports. Consequently, they represent a combination of extant and historic sites. Population numbers are probably underestimated due to limited searching and difficulties in verifying juveniles. In Arkansas, for example, surveys on Forest Service land and surveys targeting the species have bolstered the confirmed number of populations in the last decade.

The map highlights the disjunct nature of both the Virginia and Georgia populations. The closest population to Georgia's is approximately 200 miles, while the closest population to Virginia's is approximately 365 miles! One can speculate on the likelihood that additional populations are awaiting discovery, especially on the Atlantic Coastal Plain.

Arkansas boasts the largest number of populations with 80. Data from 1996 shows that although a given population may number from as few as ten to over 120, more than half of the populations have less than 21 individuals (Weldy et al. 1996). Georgia and Virginia have the fewest number of populations, with one each. Georgia's population, however, contains about two dozen plants while Virginia's population reaches 120 individuals. Case (1998) analyzed the genetics of different ladyslipper populations and discovered that the Virginia population had unique genetic variation. It would be interesting to similarly investigate the genetics of the Georgia population.

This species is in decline. It is estimated that

fifty percent of the known populations in Oklahoma are now extirpated (Biosurvey 2000). Most states designate a state rank of "S1" for this species which means that it is critically imperiled in the state. Its global rank of "G3" indicates that it is rare and only locally distributed throughout its range. The threats to the Kentucky ladyslipper are similar to those of other rare species, with habitat destruction being primary. Threats across this species' range include human disturbances like conversion of natural forests into pine plantations, logging, and hydrological alterations. Over-collecting for personal or commercial use represents another threat. Biological factors may also play a role in the species decline. Weldy et al. (1996) suggest that life history traits of ladyslipper orchids in general (like difficulty of seedling establishment in the wild and many years required from seedling to flowering plant) in combination with small population size affect the growth rates of Kentucky ladyslipper populations. Other biological threats include herbivory and disturbance of substrate by animals, particularly feral hogs and deer (personal observation).

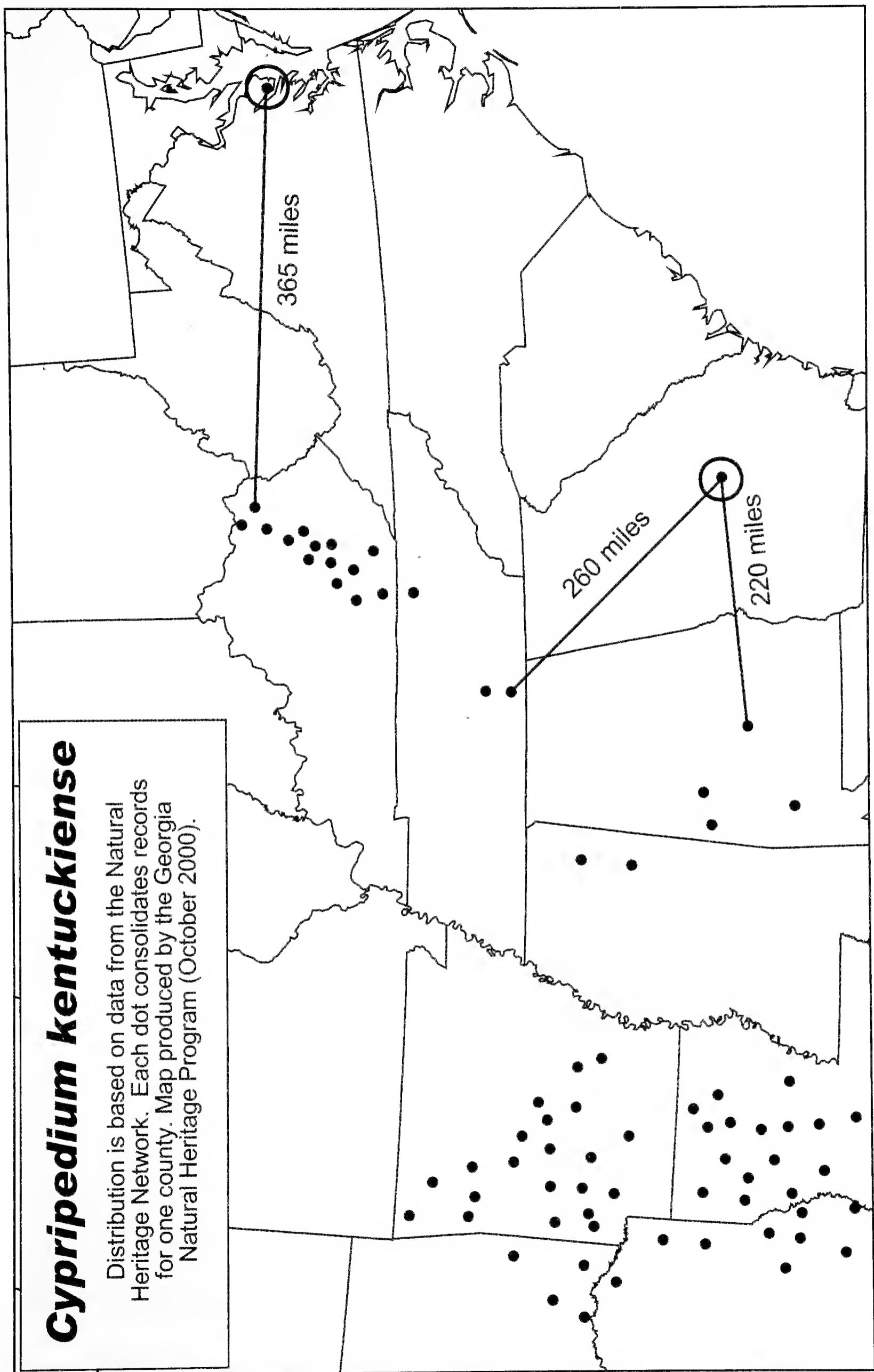
Conservation

Since the Georgia population of the Kentucky ladyslipper is fairly disjunct from other populations, this newest discovery may provide new insights into species genetics, ecological tolerances, and morphology. This discovery also establishes a range extension for the species, suggesting that additional populations may be located elsewhere within the newly defined range. This discovery also provides an impetus for Georgia-based agencies and institutions to invest in exploration and conservation efforts for the species. Such investments may include the attention of state-funded biologists, non-profit organizations, and plant enthusiasts. This (of course) is in addition to the keen eyes of BotSoccers who will hopefully make it their mission to discover new populations throughout the state.

Current conservation efforts in Georgia include securing protection for the fragile

Cypripedium kentuckiense

Distribution is based on data from the Natural Heritage Network. Each dot consolidates records for one county. Map produced by the Georgia Natural Heritage Program (October 2000).



site where the population grows as well as germinating seeds from the population. In spring 2000, Ron Determann and Carol Helton from the Atlanta Botanical Garden provided expertise on cross pollinating the three flowers. During a mid-summer survey, three fruits (almost fully grown) were observed. The fruit is a capsule (about 5.5 to 6.5 cm long and 1.3 to 1.5 cm wide) and contains potentially thousands of tiny seeds. Two fruits were collected and seeds were placed on appropriate growth substrate in a tissue culture lab. It is hoped that this micropropagation technique will generate at least a hundred seedlings which can be grown for future out-plantings in selected sites. Perhaps one day, thanks to this collaboration of plant biologists and field personnel, the Kentucky ladyslipper will be protected in more than just one small population in Georgia. ☺

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Editor's Note: In the 1994 issue of *Tipularia*, David Emory describes orchids of Georgia.

Since the Georgia population of the Kentucky ladyslipper is fairly disjunct from other populations, this newest discovery may provide new insights into species genetics, ecological tolerances, and morphology.

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A Conservation Legacy Lives On: The Charlie Elliott Wildlife Center

by W. Larry and Debra H. Davis

History

The Charlie Elliott Wildlife Center (near Mansfield, Georgia) encompasses 6,400 acres and includes Clybel WMA and Marben PFA. It is located on Georgia Highway 11, twelve miles south of Interstate 20 (approximately one hour from Atlanta). Purchased in 1993 by the Georgia Department of Natural Resources and managed by the Wildlife Resources Division, the Center offers an extensive wildlife education program, environmental education outreach programs, and a variety of hunting, fishing, and outdoor recreational opportunities. There are over four miles of hiking trails (with more planned), a primitive campground, picnic areas, and several sites for wildlife viewing. More than 150 species of birds have been observed in the area.

On January 23, 1995, the Center was

dedicated in honor of Charles Newton Elliott, the first director of Georgia's Game and Fish Commission (now known as the Wildlife Resources Division). Mr. Elliott was a well-known conservationist and writer and served as the southern field editor for Outdoor Life Magazine. He promoted the concept of conservation through education for more than 50 years. His 1994 autobiography, "An Outdoor Life," provides a fascinating look into the background of one of Georgia's most dedicated conservationists. Charlie Elliott died on May 1, 2000, but his conservation efforts live on at the Center.

Visitor's Center

Upon arrival at the Visitor's Center, guests will enter a watershed wildlife habitat exhibit, a number of informative and educational displays, and a bird viewing area. Inside is a precise replica

of Charlie Elliott's den. The den includes books, furniture, hunting trophies, and memorabilia donated by Mr. Elliott. The area around the outside of the Visitors Center is home to a recently created bog garden, a hummingbird/butterfly garden, and an aquatic exhibit.

Outside, the bog garden includes a number of rare and endangered plant species. Several pitcher plants native to Georgia can



Charlie Elliott Wildlife Center near Mansfield, GA.

be found here, including golden trumpets (*Sarracenia flava*), whitetop pitcherplants (*S. leucophylla*), hooded pitcherplant (*S. minor*), green pitcherplant (*S. oreophila*), parrot pitcherplant (*S. psittacina*), purple pitcherplant (*S. purpurea*), and sweet pitcherplant (*S. rubra*). Stokes aster (*Stokesia laevis*), swamp pink (*Helonias bullata*), Coosa Barbara buttons (*Marshallia mohrii*), and sundew (*Drosera intermedia*) can also be found in the bog as well as a variety of other plants.

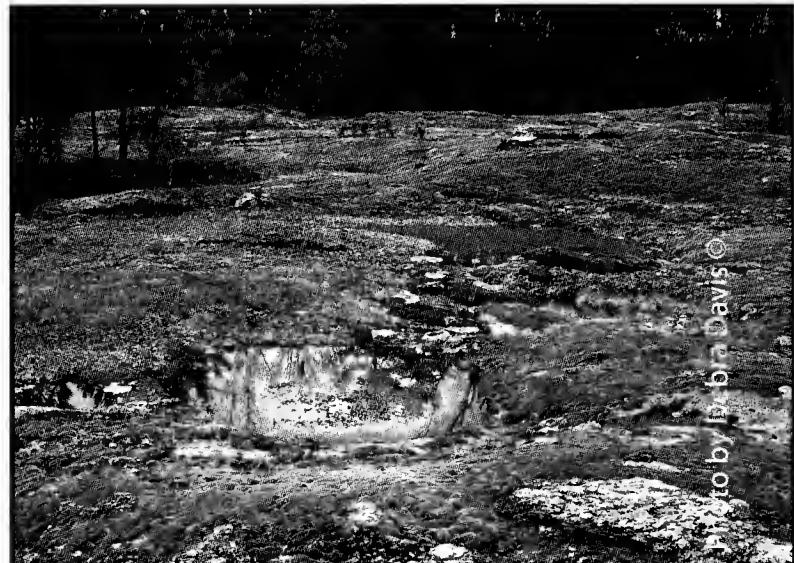
Visitors do not want to miss seeing the butterflies and hummingbirds attracted by various species of plants in the beautiful hummingbird/butterfly garden. Plants such as mountain skullcap (*Scutellaria montana*), narrowleaf obedient plant (*Physostegia leptophylla*), cardinal flower (*Lobelia cardinalis*), purple cone flower (*Echinacea purpurea*), and bee balm (*Mondarda didyma*) are among the many found in the garden.

The Aquatic Exhibit, situated behind the Visitors Center, can be viewed from an observation deck or walkway. Surrounded by a beautiful recovering hardwood forest, the exhibit houses two small pools. Plants in the upper pool include pickerel weed (*Pontederia cordata*), sensitive fern (*Onoclea sensibilis*), bracken fern (*Pteridium aquilinum*) and various species of violets (*Violaceae*). The lower pool contains yellow root (*Xanthorhiza simplicissima*), arrowhead (*Sagittaria sp.*), and foamflower (*Tiarella cordifolia*), along with other moisture-loving plants. One of the prettiest displays of resurrection fern (*Polypodium polypodioides*) can be observed on a log adjacent to the lower pool.

Natural Habitats

The Environment

The Charlie Elliott Wildlife Center is located in the Piedmont and is part of the Altamaha River drainage system. The property contains over 20 lakes and ponds



Granite outcrop habitat and its diversity of plant life.

totaling approximately 300 acres, one major stream (Murder Creek), and several smaller creeks. Land elevation ranges from 600 to 800 feet. Much of the land is in successional transition, with 2,500 acres making up old fields that are slowly reverting to woodlands and open or cut fields that are used for hunting and other recreational purposes. Approximately 3,900 acres are covered in forests. Pine and mixed pine/hardwood forests cover 2,400 acres and hardwoods cover 1,500 acres. A five acre rock outcrop is located on a hill above the floodplain of Murder Creek and groups of large boulders may be found in several areas on the property, including the primitive campground.

The Plants

An area of particular botanical interest is the rock outcrop trail (a 1.1 mile loop). The trail takes visitors up a hardwood-covered hillside and down through a pine woodland. It crosses Murder Creek and ascends another pine/hardwood forest to the outcrop. After leaving the outcrop, the trail again crosses Murder Creek and passes an area where hundreds of Jack-in-the-pulpit (*Arisaema triphyllum*) have been observed. Other noteworthy plants contributing their share of beauty include Piedmont azalea (*Rhododendron canescens*), climbing hydrangea (*Decumaria barbara*), strawberry

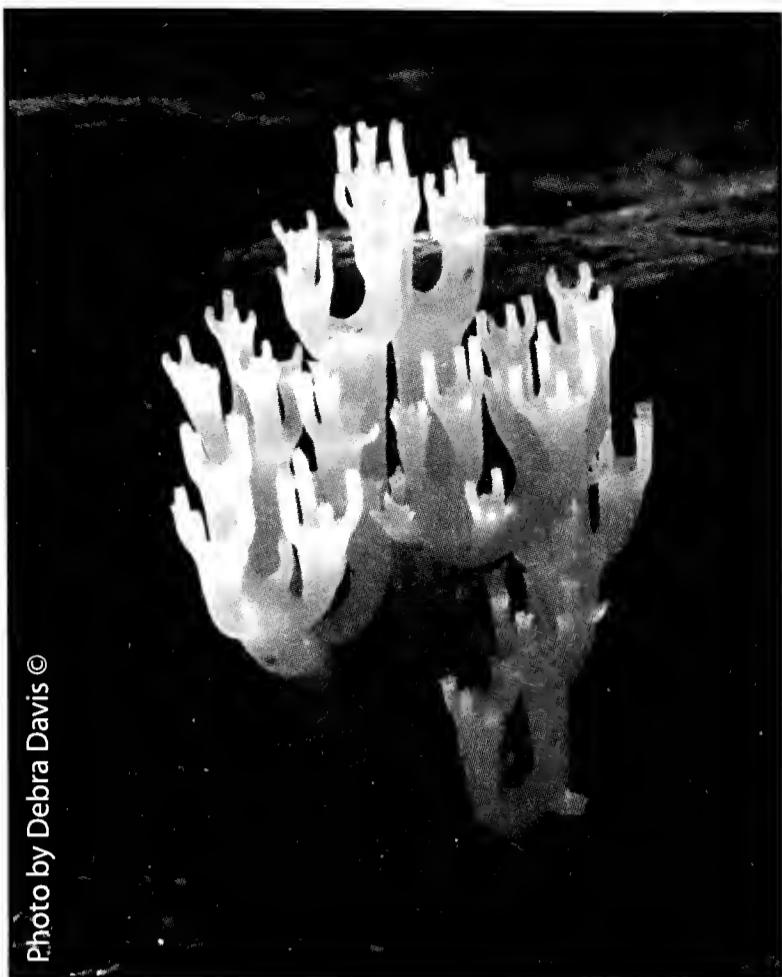


Photo by Debra Davis ©



Photo by Debra Davis ©

Crown-tipped coral (*Clavicorona pyxidata*) and shaggy stalked bolete (*Boletellus betula*) are found on the grounds of the center.

bush (*Euonymus americanus*), beauty-berry (*Callicarpa americana*), and sweet shrub (*Calycanthus floridus*).

A variety of plant life can be found on the granite outcrop. Spring visitors can observe hawthorn (*Crataegus uniflora*) at the edge of the outcrop. Lichens and mosses cover much of the outcrop with diamorpha (*Sedum smallii*) and sandwort (*Arenaria uniflora*) appearing where solution pits have collected grit and thin soil. The pinkish-white flowers of diamorpha and the white flowers of sandwort usually begin to appear in late March or early April. Other plants which can be observed at the outcrop include false garlic (*Allium bivalve*), hairy lipfern (*Cheilanthes lanosa*), yellow jasmine (*Gelsemium sempervirens*), pine-weed (*Hypericum gentianoides*), dwarf dandelion (*Krigia virginica*), hairy spiderwort (*Tradescantia hirsuticaulis*), bear grass (*Yucca filamentosa*), toadflax (*Linaria canadensis*), sundrops (*Oenothera fruticosa*), prickly pear (*Opuntia compressa*), and rock portulaca (*Talinum teretifolium*). These beautiful plants grace the outcrop with a myriad of colors. In the fall, Confederate daisy (*Helianthus porteri*),

having survived the harsh summer conditions on the outcrop, rewards visitors with a golden display.

The areas around the many lakes, ponds, and streams, as well as ravines and deeply shaded hillsides, provide excellent habitats for many species of ferns, including the Southern lady fern (*Athyrium filix-femina* var. *asplenioides*), ebony spleenwort (*Asplenium platyneuron*), Christmas fern (*Polystichum acrostichoides*), resurrection fern (*Polypodium polypodioides*), and the netted chain fern (*Lorinseria areolata*). A special treat is the Southern adder's tongue fern (*Ophioglossum vulgatum* var. *pycnostichum*) which can be observed along the rock outcrop trail.

The Mushrooms

The southeastern United States is home to several thousand species of mushrooms. Mushrooms lack chlorophyll and belong to the Fungi Kingdom. Mushrooms and other fungi are often overlooked or ignored. They do, however, interact with their environment in many ways. Some form symbiotic relationships

with vascular plants while others may be parasitic and may eventually destroy their hosts. Others are found gracing a fallen log or adding rich color to the forest floor. Fungi, along with bacteria, break down dead organic matter and help maintain a healthy ecosystem.

The diverse habitats of the Center support a wonderful array of fungi that are well worth noting. With sufficient rainfall, it is possible to find oysters (*Pleurotus ostreatus*) on trees, lobster tails (*Hypomyces lactifluorum*) on the ground, witch's butter (*Tremella mesenterica*) on the pines, and black tulips (*Urnula craterium*), milk caps (*Lactarius spp.*) and little scarlet cups (*Sarcoscypha occidentalis*) in your path. One can encounter an old man of the woods (*Strobilomyces floccopus*), dead man's fingers (*Xylaria polymorpha*) and destroying angels (*Amanita virosa*) too. The elegant Caesar's mushroom (*Amanita caesarea*), bird's nests, (*Cyathus striatus*), honeys (*Armillaria mellea*), the "aromatic" stinkhorns (*Mutinus elegans*), crown tipped coral, (*Clavicorna pyxidata*), golden spindles (*Clavulinopsis fusiformis*), and shaggy manes (*Coprinus comatus*) also grace the woods. The bright reds and oranges of the russulas, chanterelles, and boletes can be seen for quite some distance.

Conclusion

The Charlie Elliot Wildlife Center has much to offer its visitors. Whether you go to enjoy the flora of the outcrop and forest, the beauty of the old fields covered in thistles and goldenrod, the stateliness of the oaks, or the enchanting beauty of a sunrise or sunset on one of the ponds, you will experience a sense of renewal so familiar to those who love the outdoors. ☺

Additional Reading

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Author's Note: Special appreciation is extended to the staff of the Charlie Elliott Wildlife Center for the historical information provided for this article.



Witch's butter (*Tremella mesenterica*) fruiting on pine.

Photo by Debra Davis ©



Reconnaissance for the Ocmulgee Skullcap

(*Scutellaria ocmulgee*)

by Wayne Morris, Eric Van De Genachte, Tom Patrick, and Shan Cammack

History of the Ocmulgee Skullcap in Georgia

The plant now known as Ocmulgee skullcap (*Scutellaria ocmulgee*) was first described by John K. Small, who collected it near Macon in the 1890's. According to Collins (1976), Dr. Small had preprinted all the labels to his collections for that particular trip. When published, Small gave the habitat as river bluffs above Macon, but all the labels with the actual

specimens described the habitat as the river swamp below Macon. During limited field research for his dissertation, Collins was unable to pinpoint any Ocmulgee skullcap localities. It was not until the late 1970's that Steve Bowling rediscovered Ocmulgee skullcap (most likely near the original locality) while exploring natural areas along the Ocmulgee River. Steve cultivated the plants and for a long time was the only botanist aware of the existence of the Ocmulgee skullcap. He did not realize the importance of his discovery until he saw actual photographs of Small's specimens while visiting the Smithsonian Institution many years later. Steve also found the same plant growing along bluffs of the Savannah River north of Augusta during a birthday expedition on August 25, 1980. This was one of the first Bowling discoveries investigated by botanists and friends of the Georgia Natural Heritage Program (GNHP).

With two precise sites located, the stage was set for searching with renewed rigor. In 1995, the Georgia Department of Natural Resources added *Scutellaria ocmulgee* to its official list of protected plants. In 1999, GNHP commissioned several field botanists and ecologists to survey the state for populations. Frankie Snow covered the bluffs and riverbanks along the lower Ocmulgee and Altamaha rivers. Wayne Morris conducted surveys along the Savannah River. Shan Cammack, Eric Van De Genachte, and Tom Patrick explored the upper Ocmulgee and Oconee rivers.



Photo by Wayne Morris

Ocmulgee skullcap (*Scutellaria ocmulgee*) and habitat.

Overview of Study

With a grant from the U.S. Fish & Wildlife Service, GNHP conducted reconnaissance for the Ocmulgee skullcap. Focus areas were bluff habitats along the four previously mentioned river systems. Based on the locations of known populations, biologists sought bluff habitats that had exposures to the north or northeast. In order to locate bluffs with these exposures, GNHP staff used GIS software along with digital copies of USGS topographic maps to plot potential sites. Over 200 potential survey sites were identified in the four river basins using this methodology and maps were generated to aid in field surveys.

Despite several obstacles during the survey, it is believed that 17 new populations were discovered. Closer inspection of the other sites may reveal more. These discoveries increased the number of known populations in Georgia to 31 sites. Outside Georgia, the only other confirmed site in the world is in Aiken County, South Carolina. Five new populations were found along the Oconee River, two along the Altamaha River, and 10 along the Savannah River. Biologists were successful in not only finding new populations of the rare Ocmulgee skullcap, but other rare species as well (see Table 1).

Some of the obstacles biologists faced during the survey included identification challenges, drought (a seasonally compressed survey window), and limited access to sites. Distinguishing between the 18 *Scutellaria* species found in Georgia can be difficult. In

some cases, vegetative characteristics are unreliable for segregating taxa. In other cases, diagnostic features are only well-expressed when the plant is large and in flower. Because the summer of 1999 was a second consecutive drought year, identification challenges were exacerbated because the Ocmulgee skullcap does not always display the typical patterns of growth and phenology during times of stress.

Plant Description

This is a perennial herb with 4-sided stems which reaches 40 to 80 cm tall. The upper stem has two types of trichomes (hairs): straight, spreading knob-tipped hairs (glandular) and shorter, upwardly curved, slender-tipped hairs (eglandular). Leaves are highly variable in shape, opposite, covered beneath with velvety hairs, and have rounded, shallow teeth on the margin. Generally, lower stem leaves are cordate, mid-stem leaves are longer (5 to 8 cm) and are oblong-ovate with truncate bases, and upper stem leaves are smallest, gradually becoming bract-like in the inflorescence. The flowers are in racemes or panicles that are 15 to 20 cm long, are terminal and axillary from the upper leaf axils, and emit a faint, rather sweet fragrance. The calyx is bilabiate (2-lipped) and is covered with short, curled hairs. The corollas can range in color from dull blue to violet-blue with white splotches and a conspicuous longitudinal white stripe down the middle. The

Table 1. Additional species of conservation interest located during the Ocmulgee skullcap survey.

Common Name	Scientific Name	Common Name	Scientific Name
Cutleaf agrimony	<i>Agrimonia incisa</i>	Broadleaf bunchflower	<i>Melanthium latifolium</i>
Sedge	<i>Carex venusta</i>	Indian olive	<i>Nestronia umbellula</i>
Kentucky ladyslipper	<i>Cypripedium kentuckiense</i>	Oconee azalea	<i>Rhododendron flammeum</i>
Glade larkspur	<i>Delphinium carolinianum</i>	Yellow coneflower	<i>Rudbeckia nitida</i>
Greenfly orchid	<i>Epidendrum conopseum</i>	Yellow flytrap	<i>Sarracenia flava</i>
Swamp privet	<i>Forestiera acuminata</i>	Carolina pink	<i>Silene caroliniana</i>
Gopher tortoise	<i>Gopherus polyphemus</i>	Ovate catchfly	<i>Silene ovata</i>
Standing cypress	<i>Ipomopsis rubra</i>	Trepocarpus	<i>Trepocarpus aethusae</i>
Pineland barbara buttons	<i>Marshallia ramosa</i>	Relict trillium	<i>Trillium reliquum</i>



Close-up of the Ocmulgee skullcap's flower.

tube and lip together are 18 to 23 mm long. The fruit consists of four nutlets enclosed within the firm, persistent calyx, which has a noticeable protuberance (the "skullcap") on the upper lip. The best time to search for the plant is during flowering which occurs between June and July and sporadically later. Fruiting occurs between August and November (Patrick et al. 1995).

Species of skullcaps are difficult to distinguish. Flower size, leaf shape, and types of hairs are needed for accurate identification. One of the more reliable diagnostic characteristics is the presence of two types of hairs on the upper stem of *S. ocmulgee*. This character is particularly evident at a point along the stem about two internodes below the base of the inflorescence. In order to document this character, staff took microscopy photographs. In the field, hairs need to be verified by a hand lens.



Super close-up shot of the diagnostic hairs on the Ocmulgee skullcap's stem.

Habitats and Plant Associates

Understanding the specific ecological aspects of a plant's habitat (soils, aspect, and associated plant species) can be a very useful way to locate new populations for rare species. In general, we know that the Ocmulgee skullcap occurs in mesic Southern mixed hardwood forests and bluff forests with northern or northeastern exposures. This section takes a closer look at the specific components of the skullcap's habitat along the Savannah River. A list of the species that were commonly associated with the Ocmulgee skullcap along the Savannah River can be found in Table 2. Many of these sites are often underlain by calcareous material of the McBean and Dry Branch Formations of the late Eocene age, especially in Burke County (Paulk 1986). The geological formations are characterized by green fossiliferous sands and marls with a mixture of clay, chert, and limestone, including embedded oyster shells. The presence of oyster shell is clear evidence that the Fall Line (from Augusta to Columbus) represents an ancient coastline. The fine sands of the Troup-Lucy soil series seem to be the preferred soil type of *S. ocmulgee* along the Savannah River. Considering these ecological factors in concert can help guide researchers in finding new populations more efficiently.

Threats and Conservation Opportunities

The Ocmulgee skullcap is jeopardized by three major threats: competition, herbivory, and habitat loss. Although competition from

Herbs

Understory Trees, Shrubs, and Vines

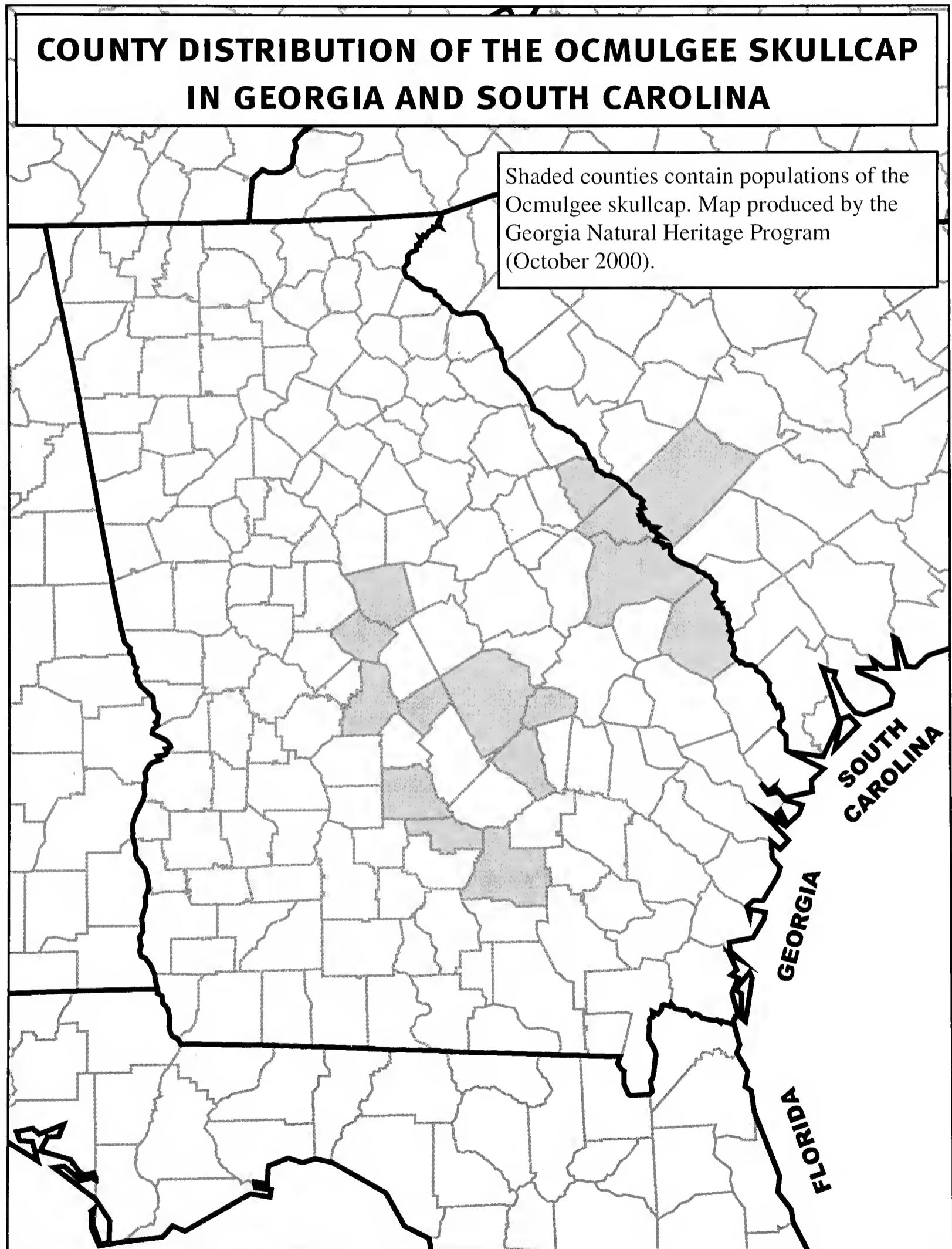
Canopy Species	
Common Name	Scientific Name
Maidenhair fern	<i>Adiantum pedatum</i>
Fly-poison	<i>Amianthium muscaetoxicum</i>
Blue star	<i>Amsoua tabernaemontana</i>
Wild ginger	<i>Asarum canadense</i>
Ravine grass	<i>Brachyelytrum erectum</i>
Bluebell	<i>Campanula americana</i>
Interrupted woodoats	<i>Chasmanthium sessiliflorum</i>
Pipsissewa	<i>Chimaphila maculata</i>
Collinsonia	<i>Collinsonia verticillata</i>
Squaw-root	<i>Conopholis americana</i>
Spiderwort	<i>Cuthbertia sp.</i>
Beggar's ticks	<i>Desmodium nudiflorum</i>
Beggar's ticks	<i>Desmodium pauciflorum</i>
Beech-drops	<i>Epifagus virginiana</i>
Bedstraw	<i>Galium circaeans</i>
Wild geranium	<i>Geranium maculatum</i>
Hepatica	<i>Hepatica americana</i>
Alumroot	<i>Heuchera americana</i>
Heart leaf	<i>Hexastylis arifolia</i>
Carolina lily	<i>Lilium michauxii</i>
Partridgeberry	<i>Mitchella repens</i>
Basketgrass	<i>Oplismenus setarius</i>
Lop-seed	<i>Phryma leptostachya</i>
May-apple	<i>Podophyllum peltatum</i>
Solomon's seal	<i>Polygonatum biflorum</i>
Christmas fern	<i>Polystichum acrostichoides</i>
Bloodroot	<i>Sanguinaria canadensis</i>
Starry campion	<i>Silene stellata</i>
False Solomons-seal	<i>Smilacina racemosa</i>
Indian pink	<i>Spigelia marilandica</i>
Chickweed	<i>Stellaria pubera</i>
Meadow-rue	<i>Thalictrum dioicum</i>
Meadow parsnip	<i>Thaspium barbinode</i>
Spiderwort	<i>Tradescantia subaaspera</i>
Catesby's trillium	<i>Trillium catesbeii</i>
Mottled trillium	<i>Trillium maculatum</i>
Bellwort	<i>Uvularia perfoliata</i>
Violet	<i>Viola walteri</i>
Atamasco lily	<i>Zephyranthes atamasco</i>

Common Name	Scientific Name
Buckeye	<i>Aesculus sp.</i>
Mountain laurel	<i>Kalmia latifolia</i>
Giant cane	<i>Arundinaria gigantea</i>
Spice-bush	<i>Lindera benzoin</i>
Dwarf pawpaw	<i>Asimina parviflora</i>
Sourwood	<i>Oxydendrum arboreum</i>
Southern buckthorn	<i>Bumelia lycoidea</i>
Moonseed	<i>Menispermum canadense</i>
Beauty-berry	<i>Callicarpa americana</i>
Wild bean	<i>Phaseolus polystachyus</i>
Sweet shrub	<i>Calycanthus floridus</i>
Mack-orange	<i>Philadelphus inodorus</i>
Ironwood	<i>Phillyrea tenuifolia</i>
Carolina buckthorn	<i>Rhamnus caroliniana</i>
Georgia hackberry	<i>Celtis tenuifolia</i>
Palmetto	<i>Sabal minor</i>
Redbud	<i>Cercis canadensis</i>
Bladdernut	<i>Staphylea trifolia</i>
Fringe tree	<i>Chionanthus virginicus</i>
Dwarf smilax	<i>Smilax pumila</i>
Flowering dogwood	<i>Cornus florida</i>
China-root	<i>Smilax tamnoides</i>
Stiff cornel dogwood	<i>Cornus asperifolia</i>
Starax	<i>Styrax grandifolia</i>
Wild yam	<i>Dioscorea villosa</i>
Horse-sugar	<i>Symplocos tinctoria</i>
Strawberry bush	<i>Euonymus americanus</i>
Slippery elm	<i>Ulmus rubra</i>
Witch-hazel	<i>Hamamelis virginiana</i>
Summer grape	<i>Vitis aestivalis</i>
Wild hydrangea	<i>Hydrangea arborescens</i>
Muscadine	<i>Vitis rotundifolia</i>
American holly	<i>Ilex opaca</i>

Table 2. Plant species commonly associated with the Ocmulgee skullcap as determined in the 1999 Savannah River surveys.

native species (via community succession) certainly impacts skullcap populations, the most acute threat is waged by exotic species like Chinese privet (*Ligustrum sinense*), Chinaberry (*Melia azedarach*), Japanese honeysuckle (*Lonicera japonica*), and Russian olive (*Elaeagnus umbellata*), to name a few.

These aggressive plants can displace the natural understory shrubs and vines and the herbaceous layer in the forest. Herbivory, particularly by feral hogs (*Sus scrofa*) and deer (*Odocoileus virginianus*), can have profound impacts on small, isolated populations. Feral hogs can be remarkably (and unexpectedly)



agile, even on relatively steep bluffs. Lastly, the omnipresent threat of human encroachment and habitat conversion is a very serious detriment to the recovery of this species. Although many of the bluffs upon which the species can be found are too steep for commercial silvicultural operations, small-scale timbering in the area does occur. The clearing of forest in the uplands and on the crest of the bluff for conversion to pine plantations or residential development degrades adjacent habitats with erosion. A possible secondary result of habitat modification is an increase in hybridization. Conversion of habitats from the cool, dim, mesic conditions of mature forests of north-exposed

ravines to the hotter, drier, bright conditions of a clear-cut ravine may promote the establishment of other *Scutellaria* species which are adapted to such conditions. Bringing various *Scutellaria* species together may facilitate hybridization with the Ocmulgee skullcap, effectively polluting and diluting its specific gene pool (introgression).

There are several inexpensive conservation efforts that could be employed to facilitate the protection and recovery of the Ocmulgee skullcap. First, more information is needed. The taxonomic challenges can be daunting. Establishing an *ex situ* garden of the sympatric *Scutellaria* species would help in confirming the identity of ambiguous populations and in training biologists to segregate the species when they are in their vegetative states. Additional surveys should also be formally conducted along these rivers and beyond the bluff systems. Second, landowners

that have the rare plant should be contacted. For those interested, management recommendations should be offered. It would also be useful to link landowners with incentive programs for restoration activities (soil stabilization, forest restoration, natural areas protection, etc.).

Finally, keen botanists with an eye to the ground can provide essential information.

The map depicts the most current information on the range of this species by highlighting the counties where it has been documented. Certainly, if anyone happens to find the Ocmulgee skullcap in their travels, please contact the Georgia Natural Heritage Program (770-918-6411) and help us better

understand this rare species. ☺

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*The Ocmulgee skullcap,
like other treasured
wildflowers, is being
impacted by habitat loss,
herbivory, and
competition by
exotic species.*



Searching for Georgia's Big Trees

by Doug Riddle

Like many of you, my son Jess and I enjoy the out-of-doors. There is grandeur, beauty, and serenity in Nature that make it special for each of us. What Jess and I primarily seek out are "Big Trees" across the state. Secondarily, we look at trees anywhere we happen to travel. In Georgia, as in many other states, a Big Tree Register is maintained, documenting the largest example of each tree species. There is also a National Register of Big Trees that is main-

the tree, and 3) one fourth of the average branch span. This third part is found by measuring the widest and narrowest branch spans of the tree and averaging the two numbers—then multiplying by $\frac{1}{4}$.

That is the pure math—figuring it in the field gets a little challenging! Trees in the mountains rarely are on level ground, so we measure from the mid-slope on one side of the tree. Tree crowns are not always symmetrical or have a single stem, so we try to measure a tree from more than one side to find the highest reading and to find a consistent height measurement. While we enjoy being at the base of a big tree, sometimes that is not possible. When a tree is on the

opposite side of a creek, we can still get a height reading using a little geometry, a Bushnell 400 laser to measure distance, and a Suunto clinometer to measures angles. We have even measured trees from a canoe as we paddled in the Okefenokee Swamp and along Ebenezer Creek. Enough of the math though, now for the fun part: finding the trees.

Searching for big trees is something that has been a family activity for over 10 years. When Jess was 6 years old, I identified the species of trees in our yard. This was an introduction to the world of leaf shapes, diversity of

tained by American Forests in Washington, D.C. These registers contain both native and non-native species. Anyone is welcome to submit an entry tree. The tree can be found in forests or front yards, from the Okefenokee Swamp to mountain tops and from arboreta to the side of the road.

The submittal process is a one page form that contains the tree's dimensions, location, condition, and owner contact information. Tree dimensions for state and national recognition are measured in the same way. There is a point system which is the sum of three parts of the tree: 1) circumference at breast height (cbh) which is measured 4'6" from the ground, 2) the height of

Total points=cbh + height + $\frac{1}{4}$ average branch span
The cbh is measured in inches while the height and branch span are measured in feet.

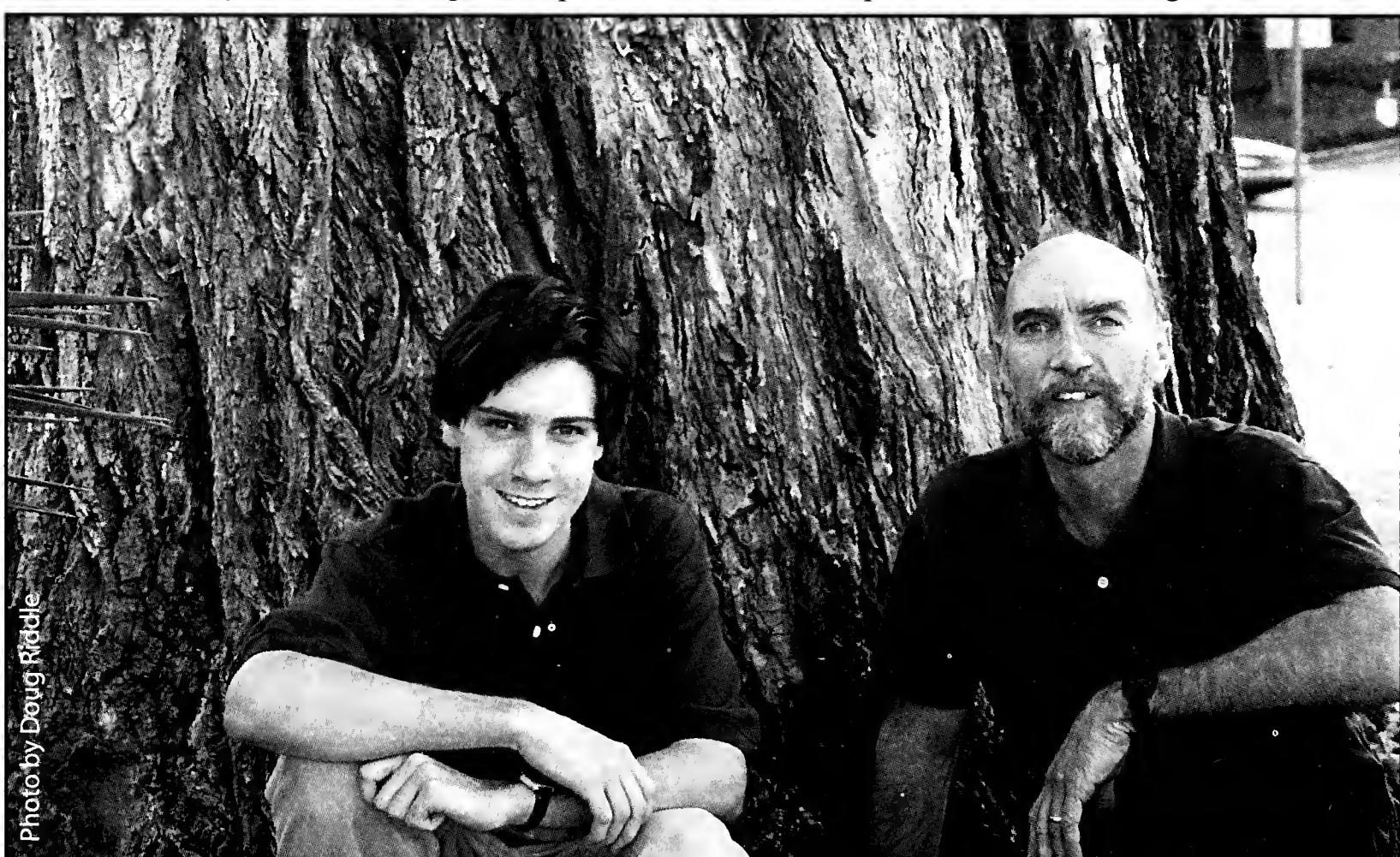
acorns and nuts, patterns of bark, structures of tree crowns, and importance of habitat. The first item, the leaves, is the part I identified for Jess. We have learned the importance of the other features together, over the years. After mastering our own yard, Jess and I started looking for big trees first where we live, in Roswell, GA. Interestingly, we have found both state and national champion trees in north Fulton County.

Recently, Jess found a big leaf magnolia (*Magnolia macrophylla*) on the north slope of the property at Bulloch Hall. This tree is not only a state champion, but is also being submitted as the National Champion of the species by Willard Fell, the Georgia registered forester who maintains Georgia's Champion Trees. Big leaf magnolias are not common in Georgia. They generally occur in pockets, and two of the locations are at Bulloch Hall and Vickery Creek Park (part of the Chattahoochee River Park System). This species can be easily recognized by its leaves, which are up to 26" long! The blossoms are also huge and can be seen in the springtime if you drive down Oxbo Drive in Roswell.

Another former champion tree in north Fulton County is the Georgia or painted

buckeye (*Aesculus sylvatica*). It is located along a stream that feeds into the lake at Mountain Park. Now for many, the terms "champion tree" or "big tree" conjure up an image of a spreading oak with limbs that could shade an entire house. That is not always the case for trees listed in a Big Tree Register. In fact, our Georgia buckeye may appear diminutive to some with only 12" cbh, 28' ht and 16' branch span for a total of 44 points—and yet it was the Georgia Champion Tree in early 1999. (It has been superceded by two larger trees.)

Trees are like flowers, birds, or any other grouping. While different species come in a variety of sizes and shapes, each is unique and deserves appreciation on its own merits. The largest tree we have measured is a bald cypress (*Taxodium distichum*) along Ebenezer Creek in Effingham County. It has the following stats: 32'11" cbh, 78' ht, and 53' branch span, for a total of 486 points. Contrast that with the smallest number of points, 30, which has occurred on several species. One example is a swamp dogwood (*Cornus stricta*) measuring 7" cbh, 20' ht, and 13' branch span. Trees run the gamut between



Jess and Doug Riddle by the champion eastern cottonwood (*Populus deltoides*) in Fulton County.



Yellowwood (*Cladrastis kentuckea*) and Jess Riddle.

these two extremes. Other big tree hunters have found even larger trees and that is part of the fun, just hiking and looking for trees. Will we find a champion today? The only way is to get out and look. Keep in mind that the tree may be one you pass by regularly: going to work, traveling to visit a friend, or while shopping on a Saturday.

One downside to searching for big trees (and especially old growth trees) is that the more you travel, the more you see evidence of Georgia being heavily logged. From the magnificent cypress in the Okefenokee Swamp, to the beautiful hardwoods in the mountains, to the pines and live oaks of the Piedmont and Coastal Plain, most old growth trees are essentially gone. Jess reads about locations of remnant old growth or selectively cut areas and then we go and look. We once paddled for six days in the Okefenokee Swamp. We have traveled by

canoe down streams and have hiked many mountain miles (up mostly). We have confirmed that the old growth stands of Georgia are all but gone. A few old growth trees remain here and there. We still hold onto the hope of finding a nice stand of mountain old growth trees.

Enough of the negative. The Okefenokee Swamp is still a great place to canoe, where you can see owls and alligators, and experience a true 400,000-acre wetland! Georgia is looking green, and each day Jess and I spend outdoors is a day well spent. Nature will regenerate herself if mankind gives her time and doesn't assault her further. So we hike and look. Some of the places we have enjoyed hiking and finding trees are as follows.

1. Stroud Creek in the Swallow Creek WMA off Hwy 76 (Towns County)

There are buckeye (*Aesculus*), silverbell (*Halesia*), black birch (*Betula lenta*), cucumber magnolia (*M. acuminata*), and yellowwood (*Cladrastis kentuckea*) that stand on either side of a nice clear Stroud Creek. This is a north facing cove, so the undergrowth is minimal and makes for easy walking.

2. Ebenezer Creek near Stillwell (Effingham County)

There are old growth cypress (*T. distichum*), water tupelo (*Nyssa aquatica*), water locust (*Gleditsia aquatica*), and green ash (*Fraxinus pennsylvanica*) located along this slow moving blackwater creek that flows into the Savannah River.

3. A Cohutta Cove about 300 yards northeast of Potato Patch (Gilmer/Murray County)

This cove has a nice stand of silverbell (*Halesia*) and buckeye (*Aesculus*) trees. When the white silverbell flowers come out in April, the canopy looks "snowy."

4. Laurel Creek near Pine Mountain on Hwy 28 (Rabun County)

This is the place to see the tallest trees in Georgia, the eastern white pines (*Pinus strobus*). Along Laurel Creek is a 178.6' white pine. Other white pines along Laurel,

Reed, and Hidden creeks reach heights between 150' and the low 160's. These are TALL trees! They are second growth, so there's no telling how tall they may eventually reach. White pines once exceeded 200' in height. We would love to find one in Georgia at this height!

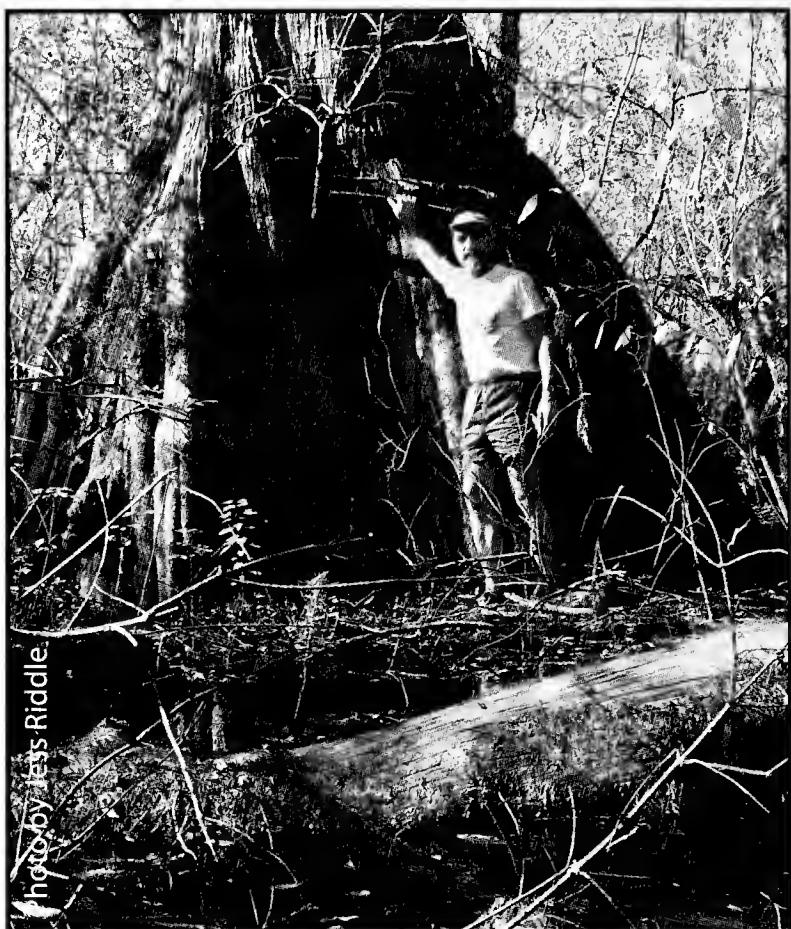
5. Reinhardt College in Waleska (Cherokee County)

In the 1940's, the college President planted many trees (native and non-native species) and documented the location and date planted. It is a nice place to visit. Many of these 40 to 50 year old trees are good size because of their open growing conditions.

6. Sosebee's Cove off Hwy 180 (Union County)

This north facing cove has an abundance of wildflowers in the spring and has the Georgia champion yellow buckeye (*A. flava*), several large tulip trees (*Liriodendron tulipifera*), and one large black cherry (*Prunus serotina*). The yellow buckeye is probably old growth. If you hike above the road up the boulder field, you will see two hard to find trees, the mountain maple (*Acer spicatum*) and yellowwood (*C. kentuckea*).

Hiking and looking for big trees has taken Jess and me to many parts of Georgia. We have gained an education in geography. We have met a lot of nice and often curious people. The most frequently asked question is "How old do you think the tree is?" This question does not have an easy answer. For an accurate age, you have to take a core of the tree and count rings. This is not always possible, however, if the tree is hollow or has a rotted interior. If the tree is beside a house or barn, or on the site of a former building, then the date the building was built can be a good approximation of the birth date of the tree. Open grown trees are often larger and have a different canopy structure than trees of the same species which are growing in the forest. Sometimes open grown trees are mistakenly thought to be old growth because of their large circumference. Trees like this that have been cut



Bald cypress (*Taxodium distichum*) and Doug Riddle along Ebeneezer Creek.

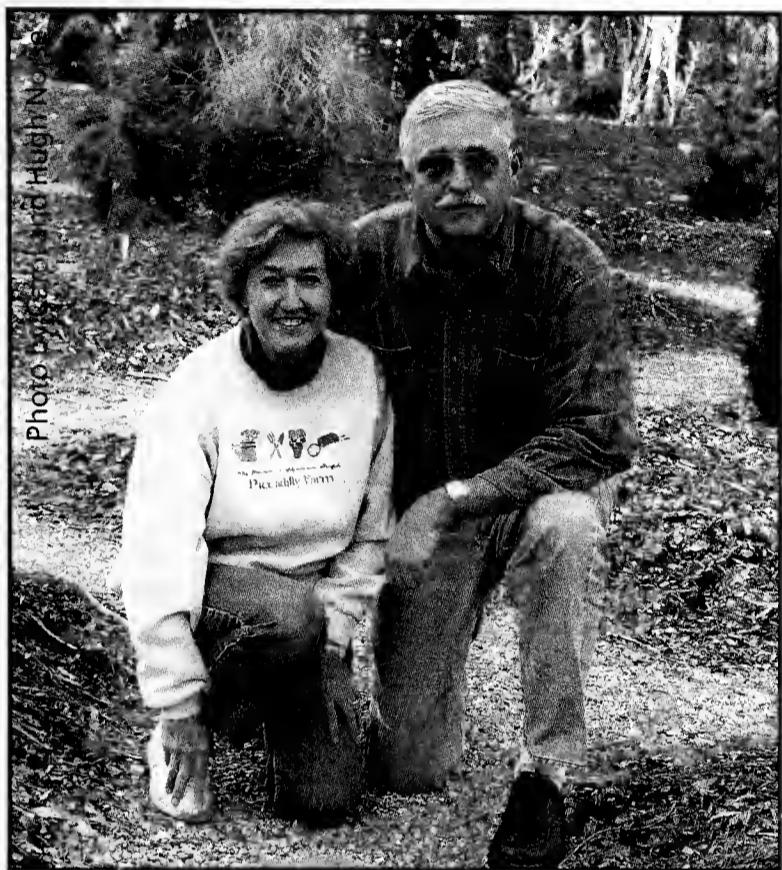
down have been found to be much younger than expected, so size alone is not necessarily an indication of age. Some of the oldest trees native to Georgia are the bald cypress (*T. distichum*), black birch (*Betula nigra*), hemlock (*Tsuga canadensis*), and the white oaks (*Quercus* spp.). The bald cypress along Ebeneezer Creek have been found to be over 1000 years old. Black birch in the Smoky Mountains have been ring-dated at over 500 years. The oaks on mountain tops are short and stunted and have circumferences of about 8 feet for a "big tree." And yet these oaks are quite old. Highlands Nature Center in North Carolina has a 30 inch cross section of a white oak from a mountain top that has a ring count of over 400. The same Nature Center has a second cross section from a hemlock tree that was cut down in the 1920's. This tree was living when Columbus arrived in the Americas. Imagine the stories it could tell. ☺

Editor's Note: Doug and Jess have over 40 listings in Georgia's Champion Trees!



Dr. Samuel B. Jones, Jr.: A Life with Plants

by Carol and Hugh Nourse



Sam and Carleen Jones at Picadilly Farm.

On a sunny January afternoon, Sam Jones meets us at the entrance to Piccadilly Farm, where we have come to talk with him about his career in botany and horticulture. "If you've got time, squeeze into this golf cart with me and I'll show you the parts of this place that most visitors don't get to see," he says. So we're off on a grand tour, past the shade houses where dormant hostas, hardy ferns, and conifer cuttings spend the winter, through the hellebore production area, beside the "old" dwarf conifer garden and over to the "new" dwarf conifer garden. Along the way, Sam provides a rapid commentary on the operation of the nursery and on any unusual, spectacular, or interesting plants we pass, such as the beautiful blooming winter-sweet (*Chimonanthus praecox*). We quickly

realize that Sam's abiding interest is with plants of all kinds.

Sam's interest in plants developed naturally through his family. "Mother's Dad grew dahlias, so my Dad started it as a hobby in the early '30's, and one thing led to another," Sam recounts. Before long the family had a florist business and greenhouses in Roswell. In 1948, while still in high school, Sam started his own small woody plant nursery. "I bought my first automobile with the money from that nursery," he says. He kept the nursery throughout his college years until 1955, when he received his B.S. (*cum laude*) in ornamental horticulture from Auburn University. In a speech class at Auburn he met his future wife, Carleen Arrington. "We had a teacher from New Jersey who spent the whole semester making fun of everyone who had a southern accent," recalls Carleen with a grin, "but, for us, some good came of it." They were married in June of 1955, shortly after Sam's graduation. Having been in Army ROTC at Auburn, Sam next served two years with the 510 Tank Battalion in Germany, and returned to Auburn University to earn a Master's degree in 1961. He received a Ph.D. in botany from the University of Georgia in 1964. When asked if he ever seriously considered pursuing a career outside botany and horticulture, Sam responded that the Army was the only other career he considered.

From 1964 to 1967, Sam was a faculty member at the University of Southern Mississippi. He then accepted a position at the University of Georgia (UGA), where he

was professor of Botany until his retirement in 1991. Part of his academic research focused on the taxonomy of *Vernonia* in the Composite Family (*Compositae*). Why, we asked, did he concentrate on vernalias? “It appeared to be a group of plants where I could use the techniques that were used in those days, biosystematics, where people grew living plants, made F¹, F², and back-crossed hybrids, and looked at the results. There were taxonomic problems, because there were a lot of natural hybrids due to changing land use patterns and so forth. At the time I started, I had no idea whether I could even grow the plants, or where the research would go. It is a large group, maybe a thousand species in the genus. At one time I was growing all the vernalias of the eastern U.S. and Mexico.” Because the tribe *Vernoniae* is largely tropical, Sam traveled to Mexico, Peru, and Brazil to collect vernalias. In the tropics, many species are woody and tall: one in Southeast Asia grows to 30 meters in height. South of the tropics, in Argentina, the vernalias are smaller herbaceous plants like those in the United States.

Vernalias were not Sam’s only research interests. He conducted floristic surveys of Clarke County, Georgia, and in several other areas throughout the state including the Okefenokee swamp, northwest Georgia, and the Cohutta mountains. He also conducted surveys in southern Mississippi, where the land was less disturbed than in Georgia during the 1960’s. In fact, Sam made so many trips to Mississippi in his four years of field work that “somebody in the (Georgia) state legislature investigated me for all the

travel expenses,” he recalls.

From 1979 to 1991, Sam was Director of the Herbarium at UGA, succeeding Wilbur Duncan in that position. Growing out of his work at the Herbarium was the book, *Distribution of the Vascular Plants of Georgia*, which he co-authored with Nancy Coile. In addition to his duties at the Herbarium, Sam was teaching basic and advanced courses in taxonomy. Preparing and organizing the material for the taxonomy courses led to another book, *Plant Systematics*. He also co-authored, with Leonard Foote, *Native Shrubs and Woody Vines of the Southeast*, and then *Gardening with Native Wildflowers*. “Len Foote and I

had so much fun on the woody plant book, that I said ‘Let’s do something on gardening.’ That’s how the wildflower book came about. He’d occasionally come over, I’d slip off from the University, and we’d work on the manuscript. Then we would do some botanizing in northwest Georgia for the day. Len was also a good geologist. He knew where

there were limestone areas that might be loaded with shooting stars (*Dodecatheon meadia*). He knew those little places.”

During his academic career, Sam also authored or co-authored over 130 scientific journal papers, articles, and book chapters, and has written numerous articles in gardening publications. He was awarded the Silver Seal Award from the National Council of State Garden Clubs for his lifetime contributions to the study of plants.

From 1981 to 1984, Sam served as Director of the UGA Botanical Garden (now the State Botanical Garden) in addition to his duties as researcher, teacher, and Director



Hellebores in 4-inch pots
being packed into flats.

of the Herbarium. Although the Director's position at the Botanical Garden was only half-time, having so many different responsibilities made Sam's job difficult. "But it got me back to doing some horticulture, away from botany. Got me started toward what we're doing right now."

In 1982, he and Carleen opened a nursery in Oconee County. It started as a part-time effort, but by 1987, it was a full-time operation. Carleen retired from teaching biology at Oconee County High School to devote more time to the nursery and in 1991 Sam retired from UGA. They decided to specialize in hostas and hellebores after a conversation with Fred Galle, the horticulturist at Callaway Gardens. "When I talked with Fred about the nursery, he told me to grow hostas and hellebores—they were going to be popular, so we did." Piccadilly Farm is now the largest wholesale shipper of hellebores in the U.S., producing 30,000 gallon-sized and 160,000 4-inch-pot-sized plants last year. "*Helleborus* is the plant that pays the bills, that supports our gardening hobby," declares Sam. The annual Hellebore Day at

the Farm drew so many people (over 1,800 in 1999) that it had to be expanded to a two-day event in 2000. In the 4.5 acre production area, there are dozens of hellebore seed beds and thousands of plants in four-inch and gallon-sized pots. It takes two years from seedling to potting-up size, and another two years until blooming. Before the plant blooms, it is impossible to tell what color the flowers will be. What used to be considered a single species, *Helleborus orientalis*, is now known to contain at least five separate genetic lines, so they are now properly called *Helleborus x hybridus*.

A newer specialty for Sam and Carleen is the production of dwarf conifers. "I like conifers," says Sam. "They really need to be used more in the garden because they provide year-round interest." Piccadilly Farm offers so many cultivars that the original conifer display area became too small. Now, a large new conifer display garden shows them off handsomely.

As the nursery has grown, a division of labor has developed. For example, Sam does most of the bookkeeping and takes cuttings



Photo by Carol and Hugh Norse

Dwarf conifer display area.

of the conifers. Carleen propagates unusual hellebores and does much of the gardening in the 2.5 acre display areas. One of her favorite spots is the winter garden because it is at its best when she has more time to garden. Because of the growth of the nursery, they now employ two year-round assistants and additional temporary help during the busy seasons. "I try to stay out of the shipping now," says Carleen, "because the employees can do that as well as I can." Having reliable employees allows Sam and Carleen to travel more frequently. Sam accepts fewer speaking engagements than he used to so that they can schedule three or four trips a year. However, Sam still particularly enjoys giving a series of Saturday morning lectures at the nursery each spring. "Out of doors, walking required," states the Piccadilly Farm brochure. Topics include "Wild Flower Gardening," "Dwarf Conifers," and "Shrubs for your Garden."

According to Sam, the purpose of the nursery is twofold: to have a profitable nursery, but also to have an enjoyable one. He remembers when "... the nursery industry used to be made up of small family nurseries run by people who really liked plants. They sometimes grew plants they couldn't even sell, just because they liked them." That is not often the case anymore with the large corporate nurseries being prevalent today. But there is no doubt that Sam and Carleen enjoy their plants. "I'd be terribly unhappy if I didn't have this. Carleen too. We need something to do, both mentally and physically. You can never know all there is to know about plants. You're constantly learning, and that's just a real joy," Sam declares.

Sam has been doubly fortunate. He has spent much of his life working with plants and has found in Carleen a life partner who shares that joy. ☺



Conifer cuttings in the shade house.

Photo by Carol and Hugh Norse



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AUTHORS CONTINUED

Carol Nourse, M.S. and Hugh Nourse, Ph.D., are plant writers/photographers. They have authored/photographed a book, *Wildflowers of Georgia* (Athens: UGA Press, 2000). Another project has been to photograph protected plants of Georgia for which the Georgia Natural Heritage Program does not have slides. They are also volunteer photographers for the State Botanical Garden of Georgia. Hugh is President of the Georgia Botanical Society.

Tom Patrick is the state botanist for the Georgia Natural Heritage Program. While he works statewide, Tom is partial to pitcherplant bogs and to the mountains which harbor *Trillium*. He conducts rare species surveys, conducts the permit program for protected plants, and participates in management activities at several conservation sites.

Doug and Jess Riddle

Doug is an electrical engineer who complements his design time with weekend hikes with his son Jess somewhere in GA, SC, NC, or TN. They are out searching for champion trees. Doug is a member of GA Forest Watch and Appalachian Trail Conference. Jess has been hiking and identifying trees for over 10 years. He is a senior at Roswell High School.

Richard Ware has served as Field Trip Chair, Vice-President, and President of the Georgia Botanical Society. He has studied trees for nearly 30 years and wildflowers for 15. Richard has discovered several rare plants new to the state of Georgia and has authored articles for the *BotSoc News* and *Tipularia*. He really enjoys looking for rare plants and being on field trips with other BotSoccers.

Eric Van De Genachte, M.S., is a conservation ecologist working for the GA DNR's Georgia Natural Heritage Program. Current projects include survey work for rare plants and animals, field assessments and protection efforts on Carolina bays, granite outcrops, and writing a 50-year management plan for Montezuma Bluffs Natural Area. Eric will be focusing more on land protection and conservation planning efforts in the future. He is co-editor of *Tipularia*.

Photo by Richard T. Ware, Sr.



Top: Ohio Buckeye
(*Aesculus glabra*)

Middle: Kentucky ladyslipper
(*Cypripedium kentuckiense*)

Bottom: Large-flowered Trillium
(*Trillium grandiflorum*)



Photo by Shan Cammack



Photo by Carol Nourse